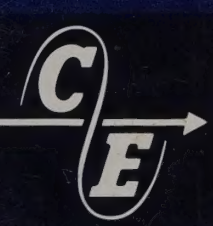
CE-6
COMMUNICATIONS MONITOR



CUSHMAN
ELECTRONICS, INC.

CE-6
COMMUNICATIONS MONITOR

CUSHMAN
ELECTRONICS, INC.
830 Stewart Dr - Sunnyvale, CA 94086
Telephone: Area Code 408 - 739-6760

January 1974

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WARRANTY

CUSHMAN ELECTRONICS, INC. WARRANTS EACH OF THE INSTRUMENTS OF THEIR MANUFACTURE TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF ORIGINAL PURCHASE. THE FOREGOING IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS, IMPLIED OR STATUTORY. THE COMPANY, UNDER THEIR LIBERAL WARRANTY, WILL REPAIR OR REPLACE ANY INSTRUMENT FOUND DEFECTIVE.

THIS WARRANTY MAY NOT APPLY TO INSTRUMENTS WHICH, IN THE OPINION OF THE COMPANY, HAVE BEEN ALTERED OR MISUSED.

This manual is intended to give the user a comprehensive knowledge of the instrument and its operation or repair. In the event of trouble, study the manual carefully. Most instrument malfunctions can be corrected by the user with a minimum of lost usage time.

For assistance or information of any kind, contact the factory. Give full details of the nature of your problem and include the model and serial number of the instrument.

Should it appear that the instrument needs to be returned to the factory for service or recalibration, let us know. Shipping instructions will be promptly given to you. There will be no charge for repair on instruments within the one year warranty other than transportation costs after 90 days of ownership. Estimates of charges for non-warranty or any other service will be supplied by the factory upon request before work is begun and such work will be done on an actual cost basis only.

CLAIM FOR DAMAGE IN SHIPMENT

Your instrument should be inspected and tested as soon as it is received. The instrument is insured for safe delivery. If the instrument is damaged in any way or fails to operate properly, file a claim with the carrier or, if insured separately, with the insurance company.

* * * * * *

We sincerely pledge our immediate and fullest cooperation to all users of our precision electronic instruments.

PLEASE ADVISE US IF WE CAN ASSIST YOU IN ANY MANNER

CUSHMAN ELECTRONICS, INC.

830 Stewart Dr. ☐ Sunnyvale, Cal. 94086 ☐ 408—739-6760

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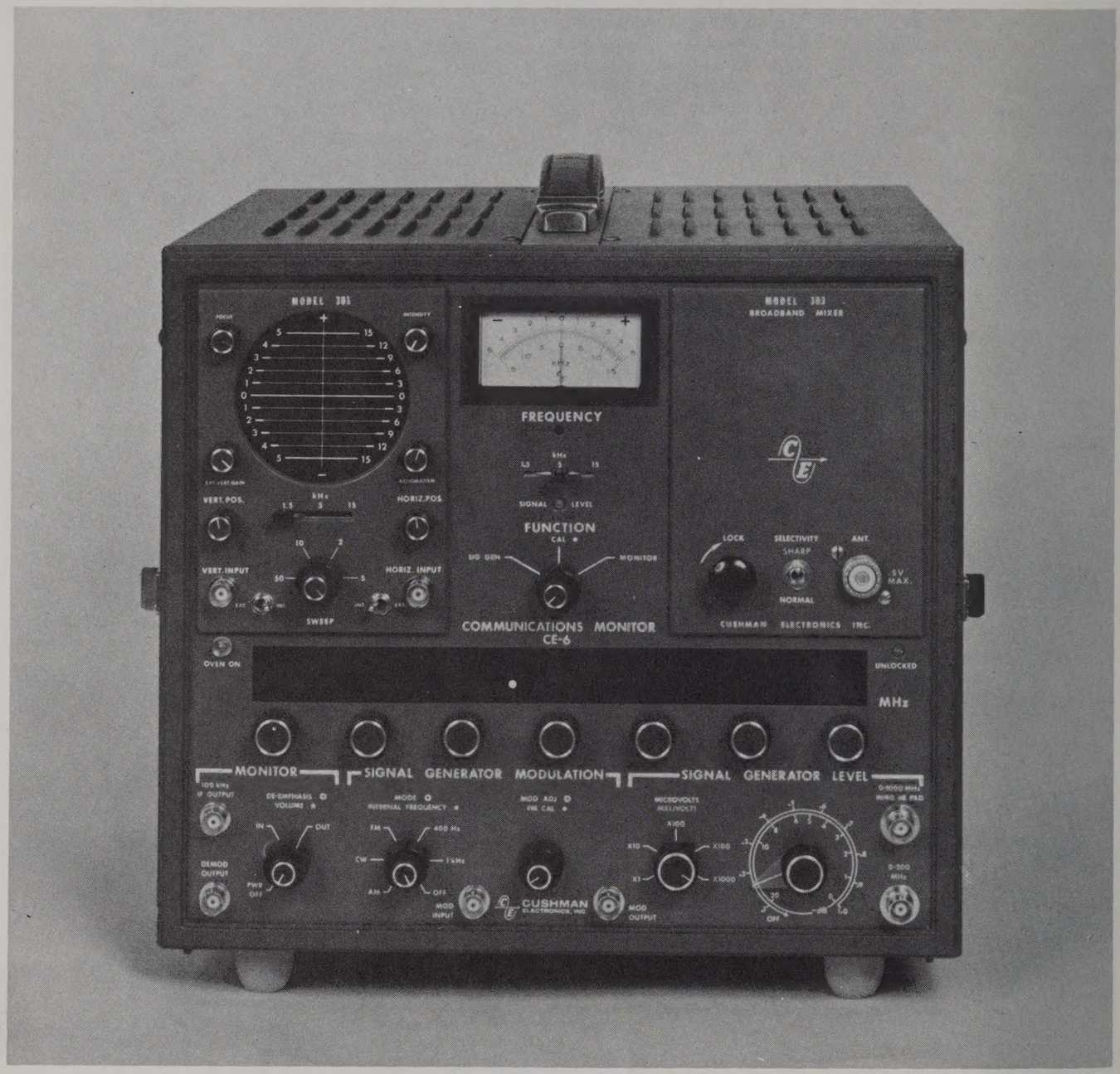

Figure 1-1. Model CE-6 Communications Monitor

SECTION 1
GENERAL

INTRODUCTION

1.01 The CE-6 Cushman Communications Monitor measures carrier frequency errors and modulation characteristics of RF signals received from radio transmitters. It also generates accurate RF and IF signals for testing sensitivity, alignment, and performance of radio receivers. In addition it generates two AF tones for use in modulation tests of FM and AM receivers, and for modulating FM and AM transmitters being tested.

1.02 A modern synthesizer tuning system is used to provide high accuracy and stability and to permit fast digital frequency selection.

1.03 The CE-6 generates RF signals over the frequency range of 10 kHz to 999.9999 MHz with a calibrated level of from .1 microvolts to 100 microvolts at the output of a 40 dB isolating pad. Approximately 100 times this level, uncalibrated, is available if the isolating pad is not used. A high level output of 10 millivolts to 1000 millivolts, calibrated from 10 kHz to 200 MHz, is also provided.

1.04 The RF output may be either CW, FM or AM. Frequency deviation or percentage of modulation is adjustable and may be monitored by the use of appropriate plug-in units.

1.05 The frequency range covered and the RF input signal strength required for monitor operation depends on the RF plug-in used. Wideband mixer plug-ins require approximately 10 millivolts or less and operate over the frequency range of 20 MHz to 999.9999 MHz. The Preselector plug-ins operate with approximately 20 microvolts or less and the frequency range is determined by the plug-in used. All the Preselectors and the AM Monitor also have wide band mixers.

1.06 The frequency of either the received or generated signal is dialed in with seven Frequency Selector switches. The difference between the dialed in frequency and the received carrier frequency or the generated FM center frequency is read on the FREQUENCY meter. When greater resolution than may be read on the meter is required a Frequency Counter may be connected to the 100 kHz IF OUTPUT connector. The reading at the connector is 100 kHz ± the difference between the dial reading and the received carrier frequency or the generated frequency.

GENERAL DESCRIPTION

1.07 The CE-6 is a very specialized superheterodyne receiver. It is equipped with plug-in units to provide maximum versatility. In this way the instrument may be tailored to fit various applications with maximum efficiency. A plug-in unit must be in each of the two compartments when the instrument is to be operated.

1.08 Plug-ins for the purpose of measuring frequency deviation of FM signals are used in the left hand compartment. An oscilloscope gives a visual display on a calibrated screen so that modulation characteristics may be seen in addition to the measurement of deviation. An FM Deviation meter plug-in provides a slightly higher accuracy of deviation readings than the oscilloscope. It is also provided with an adjustable peak level indicator. All peaks above the level to which it is preset will cause an indicator light to flash.

1.09 The RF plug-ins fit into the right hand compartment. Here either the Broadband mixers, the Preselectors or the AM Monitor may be used to receive the RF signal. The Broadband Mixers and the AM Monitor cover the full bandwidth of 20 MHz-1000 MHz. The Preselectors provide additional sensitivity so that transmitters many miles away may be monitored. The frequency range of the Preselectors is limited to the land-mobile radio communication bands. The Preselectors are also equipped with wideband mixers so that they may be used over the full 20 MHz-1000 MHz bandwidth at reduced sensitivity. While the primary purpose of the AM Monitor is to measure percentage of modulation, it is equipped with a wideband mixer so that it may also be used for FM measurements. Brief specifications for the plug-in units will be found in the table of specifications.

1.10 The incoming signal in the RF plug-in is mixed with a Local Oscillator (LO) from the CE-6. The LO is generated by a frequency synthesizer which starts with a crystal oscillator in a temperature controlled oven. The LO is the standard to which the incoming signal is compared. The LO is always 10 MHz above the incoming signal and therefore a 10 MHz Intermediate Frequency (IF) is produced by the plug-in. This IF, which contains all the frequency error, deviation and modulation of the original signal, goes to the second IF and discriminator circuits in the CE-6 where the information is removed and applied to the metering circuits. The FM signals are demodulated and reproduced in a speaker mounted in the CE-6. The FM demodulated signal is also available at DEMOD OUTPUT connector on the front panel. A de-emphasis network may also be switched into the demodulator circuits if desired. AM signals are demodulated and reproduced through a speaker in the AM monitor plug-in.

1.11 The metering circuits of the CE-6 are

Table 1-1. CE-6 Specifications

ITEM	CHARACTERISTICS
MEASUREMENT MODE	
FREQUENCY	
Range	50 kHz to 1000 MHz
Digital Resolution	100 Hz
Time Base (Master Crystal Oscillator)	
Frequency	5 MHz
Accuracy (Aging & Stability)	2×10^{-7} per year
FREQUENCY ERROR METER	
Standard	
Ranges	±1.5 kHz, ±5 kHz, ±15 kHz
Resolution	Less than 50 Hz
M-2 Option	
Ranges	±500 Hz, ±1.5 kHz, ±5 kHz
Resolution	Less than 20 Hz
INPUT SENSITIVITY	Refer to Plug-in modules specification
DEMOD OUTPUT	
Level (for 25 kHz FM Deviation)	5V into 1kΩ
Distortion	Less than 2%
Frequency Response (60 Hz to 20 kHz)	±3 dB
De-emphasis (300 to 3000 Hz)	6 dB per octave
100 kHz IF OUTPUT	
Frequency	100 kHz ± Difference between dialed-in frequency & incoming carrier frequency
Level (into 40 kΩ)	225mV ±7 dB
SIGNAL GENERATOR MODE	
FREQUENCY	
Range	10 kHz to 1000 MHz
Digital Resolution	100 Hz
Time Base (Master Oscillator)	
Frequency	5 MHz
Accuracy (Aging & Stability)	2×10^{-7} per year
LEVEL (Into 50Ω)	
Low Level Output (After External 40 dB Attenuator)	0.1 μV to 100 μV RMS
Accuracy (At 0.5μV)	
10 kHz to 512 MHz	±2 dB
512 MHz to 1000 MHz	±0.5 dB (additional)
High Level Output (10 kHz to 200 MHz)	10 mV to 1.0V RMS
Accuracy (at 0.5V)	±3 dB
SPURIOUS OUTPUTS	
Harmonics (Low Level Output)	-40 dB
Non-Harmonic Products	-40 dB
OUTPUT MODES	CW, FM, AM
INTERNAL MODULATING FREQUENCIES	400 Hz & 1000 Hz
Mod Output	
Level (Into 1kΩ)	0 to 5V
Distortion (at 1.5V)	2%

Table 1-1. CE-6 Specifications (continued)

ITEM	CHARACTERISTICS
FREQUENCY MODULATION	
Internal	
Frequencies	400 Hz & 1000 Hz
Deviation Range	0 to 25 kHz
Distortion	Less than 2%
External (Mod Input)	
Frequencies	60 Hz to 20 kHz
Deviation Range	0 to 25 kHz
Deviation Sensitivity (Nominal)	1 kHz/10mV
Input Impedance	1kΩ
AMPLITUDE MODULATION	
Internal	
Frequencies	400 Hz & 1000 Hz
Modulation Range	
Low Level Output	0-80%
High Level Output (to 0.7V RMS)	0-30%
External (Mod Input)	
Frequencies	60 Hz to 3 kHz, useable to 20 kHz
Modulation Range	
Low Level Output	0-80%
High Level Output (to 0.7V RMS)	0-30%
Sensitivity (Nominal)	80%/150 mV
Distortion (at 400 Hz)	
Low Level Output	
30% Modulation	5%
80% Modulation	10%
High Level Output	
0 to 30% Modulation	10%
Input Impedance	1kΩ
POWER REQUIREMENTS	115 VAC ±10% (230 VAC optional)
WARM-UP TIME	30 minutes
DIMENSIONS (INCHES)	12 1/4H x 13W x 18D
TEMPERATURE	
Operating	0°C to 55°C (32°F to 130°F)
Storage	-40°C to 75°C (-40°F to 167°F)
DIMENSIONS	
Height	12-1/4" (31.12 cm)
Width	13" (33.02 cm)
Depth	18" (45.72 cm)
WEIGHT (Without Plug-in Modules)	40 lbs. (18.14 kg)

Table 1-1. Specifications (continued)

ITEM	CHARACTERISTICS	
Model 301 Oscilloscope Plug-in		
Deviation Measurement Accuracy	±5% full scale in three ranges: ±1.5 kHz, 5.0 kHz, 15.0 kHz	
External Inputs	Vertical and Horizontal	
External Vertical Sensitivity	300 mV for full scale	
External Frequency Response (3 dB)	30 kHz	
Model 302 Deviation Meter Plug-in		
Accuracy of Measurements	±4% full scale in three ranges: 0-2.5, 0-6, 0-25 kHz	
Model 303 Broadband Mixer Plug-in		
Carrier Frequency Coverage	20-1000 MHz	
Sensitivity	Less than 10mV	
Input Impedance	50 ohms (nominal)	
Receiver Bandwidth (3 dB)		
Broad	75 kHz	
Narrow	13.5 kHz	
RF Preselector Plug-ins	Model 304B	Model 316
Frequency Coverage	25-50 MHz	140-175 MHz
Nominal Input Impedance	50 ohms	50 ohms
Bandwidth (3 dB)		
Broad	65 kHz	65 kHz
Narrow	20 kHz	20 kHz
Sensitivity: Less than	20 microvolts	20 microvolts
	Model 306E	Model 307B
Frequency Coverage	450-520 MHz	120-139.9999 MHz
Nominal Input Impedance	50 ohms	50 ohms
Bandwidth (3 dB)		
Broad	65 kHz	65 kHz
Narrow	20 kHz	20 kHz
Sensitivity: Less than	20 microvolts	20 microvolts
Model 313 AM Monitor	20-1000 MHz	
Input Sensitivity	Less than 10mV	
AM Modulation (Meter) Range	0-100%	

disabled until the received signal is strong enough for reliable measurements. A squelch voltage from the RF plug-in enables these circuits and turns on the SIGNAL LEVEL light on the CE-6 front panel to indicate that the circuits are operating.

1.12 Signal generation is accomplished by automatically removing the 10 MHz difference between the dialed in frequency and the local oscillator frequency and using the LO as the output signal. This signal now corresponds exactly to the frequency that is dialed in. This output may be CW, FM or AM according to the setting of the MODE switch.

1.13 Frequency modulation is accomplished with a voltage controlled oscillator and is introduced in one of the early mixing stages. The signal is amplitude modulated with a PIN diode modulator in the voltage controlled attenuator circuit.

1.14 The output level of the generated signals is adjusted in the voltage controlled attenuator which is made up of a network of PIN diode attenuators. Levels are calibrated from .1-100 microvolts at the end of the 40 dB pad (furnished) when it is connected to the 0-1000 MHz output connector. For the high level output the signal is switched to a 0-200 MHz wide band amplifier, the signal being available directly at the 0-200 MHz output connector. A fuse is mounted in the 40 dB attenuator and at the output of the Wide Band Amplifier to protect the instrument circuits.

1.15 Table 1-1 lists the specifications for the CE-6. Also listed are the pertinent characteristics of the presently available plug-in accessories that may be used with the CE-6.

ACCESSORIES

1.16 Two types of accessories are available for use with the CE-6. Units that plug into the Monitor and obtain operating power from it, and items furnished with the Monitor but not integral parts of it.

1.17 Plug-In Units

1.18 An opening in the left-hand part of the Monitor front panel, accepts either the Model 301 Oscilloscope or the Model 302 FM Deviation Meter. One or the other of these must be used to provide FM deviation measurements. A similar opening in the right-hand part of the front panel accepts a Model 303 Broadband Mixer, a Model 313 AM Monitor, or one of the presently available RF Preselectors.

1.19 The Model 303 Broadband Mixer is used in the measurement of frequency and FM deviation of local transmitters over the whole range of 20-1000 MHz. The RF Preselectors are used over the ranges of the most used bands in the same way for monitoring transmitters many miles distant. The Preselectors are also equipped with broadband mixers. The Model 313 has all the capabilities of the Model 303 and in addition it can monitor AM signals. It displays the percentage of AM (0-100%) in either the Monitor or Signal Generator modes.

1.20 The Model 301 Oscilloscope permits visual examination of the exact FM modulation on the transmitter carrier. Unbalanced modulation, power supply pulses, unusual clipping, and other problems are immediately apparent. The Model 301 has an automatic sync circuit similar to that found in laboratory instruments. The scope graticule is calibrated to show deviation on any one of three ranges: ±1.5, ±5, and ±15 kHz. Switches on the front panel permit use of external vertical inputs while using the internal sweep. External signals may also be connected to the horizontal input. This permits use of the Model 301 independently of the monitoring function, for routine testing, troubleshooting, displaying Lissajous patterns, etc. The Oscilloscope can also be used for receiver IF bandwidth measurement and discriminator alignment, as described in the Model 301 manual.

1.21 The Model 302 FM Deviation Meter provides three ranges: 0 to 2.5, 0 to 6, and 0 to 25 kHz. An instantaneous peak indicator light flashes when the absolute peak deviation of the incoming carrier exceeds an amount preset by means of the SET control. Operation and accuracy of the flasher are not affected by modulation frequency, repetition rate, or waveform. A switch permits selection and measurement of either plus (+) or minus (-) deviation peaks. A scope jack is provided for simultaneous meter indications and oscilloscope observations of deviation (a separate oscilloscope, not a Model 301, must be used).

1.22 Auxiliary Items

1.23 Two major auxiliary items are supplied with the instrument: a telescoping antenna for picking up transmitter signals and a 40 dB fixed attenuator with cable for use with the CE-6 when a generated signal is being fed into a receiver. (See Table 2-1 for a complete list of auxiliary items.) Both the attenuator and the cable are stored inside the front cover of the instrument. Installation of the antenna is described in Section 3.08 b, the use of the 40 dB fixed attenuator in Section 3.10 e.

SECTION 2
INSTALLATION

UNPACKING AND INSPECTION

2.01 When unpacking the Model CE-6 Communications Monitor inspect the packing box and the instrument for signs of possible shipping damage and see if the auxiliary items, listed in Table 2-1 and shown in Figure 2-1, are present. Verify satisfactory performance as outlined in the Operating Instructions (Section 3). If the instrument is damaged or fails to operate properly, or if any of the auxiliary items are missing, file a claim with the transportation agency or, if insured separately, with the insurance company.

ENVIRONMENTAL REQUIREMENTS

2.02 Temperature

2.03 The CE-6 is designed to operate between 0°C and +55°C (ambient). Especially in the field, these temperatures can easily be exceeded; for instance, the internal temperature of a closed automobile trunk may exceed 65°C during summer daylight hours. Do not block the cabinet ventilating louvers. Exceeding the upper or lower temperature limits for extended periods may not result in noticeable damage to the instrument, but may cause poor performance or actual malfunctioning.

2.04 RF Fields

2.05 Where extremely high RF radiation fields exist (such as when the CE-6 is used near a transmitter), the telescoping antenna should be pushed down to reduce pickup. Where many high-power transmitters are in use adjacent-channel interference may be experienced if the transmitters are operating within 90 kHz of each other. In such cases, the SELECTIVITY switch on the Model 303 Broadband Mixer should be placed in the SHARP position. If satisfactory measurements still cannot be made, direct connection between the transmitter to be monitored and the CE-6 via an RF attenuator may be required; contact Cushman Electronics for further information. (Note: In the SHARP position the bandwidth is narrowed so that Deviation readings may be degraded unless the sum of the modulation frequency plus the frequency deviation, in kHz, is less than 11. In the WIDE position this sum may be as much as 33.)

POWER REQUIREMENTS

2.06 The CE-6 operates from a 115 volt (±10%) 50 to 400 Hz AC source. Power consumption is 150 watts. If 230V AC operation is desired this must be specified in the original order. A 115 volt instrument may be converted to 230V AC by returning to the factory for the installation of a 230 volt step-down transformer and the necessary wiring changes. A modification kit, M1, #7100-0042, is also available for user installation.

WARM UP REQUIREMENTS

2.07 The accuracy of CE-6 measurements depends on maintaining the master-oscillator crystal at a constant temperature. This is done by a thermostatically controlled oven which requires a 15 minute warm-up period prior to use. (If the instrument has been stored at a temperature below +32°F, additional warm-up time may be required.) Oven operation is independent of the on-off power control and it is recommended that the instrument be installed so that it can be kept connected to its power source. Thus, the CE-6 will be ready to make precise measurements within seconds after the instrument is turned on.

PREPARATION FOR RESHIPMENT

2.08 It is recommended that the shipping box and foam packaging be kept in case it becomes necessary to ship the instrument to the service point or factory for service or repair. (Contact Cushman Electronics Customer Service Department before returning an instrument.)

2.09 The following is a general guide for repackaging the instrument for shipment.

NOTE

If the instrument is to be shipped, attach a tag to the instrument identifying the owner and showing the return address. Indicate the service or repair to be accomplished. Include the model number and full serial number on the instrument. In any correspondence, always identify the instrument by model number and serial number.

2.10 If the original container is to be used, proceed as follows:

(1) Place the instrument in the original container. (If the original container is not available, one can be purchased from Cushman Electronics.)

(2) Make sure that the container is well

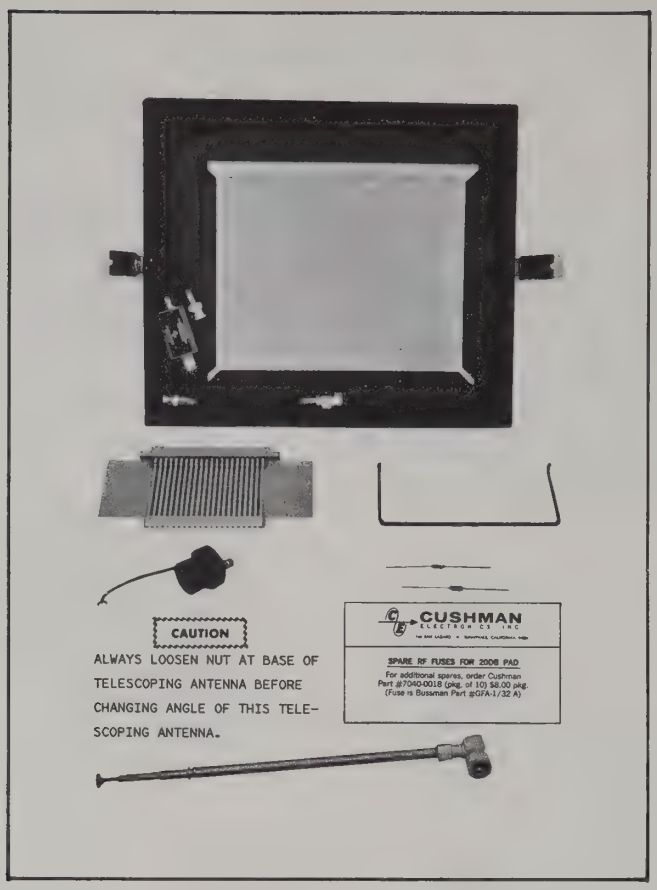
CAUTION
ALWAYS LOOSEN NUT AT BASE OF TELESCOPING ANTENNA BEFORE CHANGING ANGLE OF THIS TELE-SCOPING ANTENNA.
CUSHMAN
SPARE RF FUSES FOR 200B PAD

Figure 2-1. Auxiliary Items Furnished With the CE-6

Table 2-1. Auxiliary Items Furnished with CE-6

ITEM	DESCRIPTION	CUSHMAN STOCK NO.	QUANTITY
1	Fuse, RF, 1/32 Amp	1955-0005	2
2	Three prong/two prong AC plug Adapter	2535-0001	1
3	Extractor, P.C. Board*	3875-0036	1
4	Extender Board*	7001-0024	1
5	40-dB Fixed Attenuator/ Adapter Cable Assembly	7040-0030	1
6	RF Cable Assembly	7032-5001-01	1
7	Antenna Assembly	7040-0019	1
8	Manual, CE-6	5601-0040	1
9	Front Cover	7005-0025	1

*In circuit board compartment in bottom of instrument

sealed with strong tape.

2.11 If the original container is not used, pro ceed as follows:

(1) Wrap the instrument in plastic or heavy paper before placing in an inner container.

(2) Place packing material around all sides of the instrument.

(3) Place the instrument and inner container in a heavy carton or wooden box and seal with strong tape or metal bands.

(4) Mark the shipping container: "DE LI-CATE ELECTRONIC INSTRUMENT", "FRAGILE".

SERVICE OR REPAIR

2.12 In the event that factory service or repair seems to be required, contact the Cushman Electronics Customer Service Department for further service information or to make arrangements for shipment to the factory or to a Service Center. The factory address is:

Cushman Electronics, Inc.
Customer Service Department
830 Stewart Drive
Sunnyvale, California 94086
Telephone: (408) 739-6760

2.13 Other service centers for Cushman Electronics instruments are:

BCS Associates, Inc.
940 North Fern Avenue
Orlando, Florida 32803
Telephone: (305) 896-4881

Reshal Associates
219 West University Drive
Arlington Heights, Illinois 60004
Telephone: (312) 398-7660

SECTION 3
OPERATION

GENERAL INFORMATION

3.01 Before the CE-6 is operated a suitable plug-in should be installed in the two compartments, but they may be omitted for CW/AM SIG GEN use only. See Table 1-1 for a list of plug-in units that may be used in the CE-6 with some of their more important characteristics. Either a meter or an oscilloscope plug-in for frequency deviation measurements is used in the left hand compartment. In the right hand compartment a high sensitivity Preselector or a lower sensitivity wide band mixer or an AM Monitor plug-in may be used.

3.02 In the MONITOR function the signal is connected to the ANT. connector on the plug-in and the carrier frequency of the signal is dialed in on the CE-6 Frequency Selector switches. The carrier frequency error will then be displayed on the FREQUENCY meter and the frequency deviation will be displayed on the FM DEVIATION meter or on the oscilloscope. For an AM signal the AM Monitor will display the percentage of modulation. Both FM and AM are demodulated and reproduced by a speaker.

3.03 In the SIG GEN function the dialed in frequency is available at the 0-1000 MHz output connector. The high level connector is restricted to a bandwidth of 0-200 MHz. Type of output, FM, CW, AM, is determined by the setting of the MODE switch. Modulation may be either internal, 400 Hz or 1 kHz or external, within the frequency range 60 Hz-20 kHz or both at the same time. Output is calibrated from .1-100 microvolts at the output of the 40 dB pad when connected to the 0-1000 MHz output. One hundred times the calibrated output is available at the 0-1000 MHz output connector without the 40 dB pad, but attenuator calibration will not apply. A calibrated output of 10-1000 millivolts is available directly at the 0-200 MHz output connector. The -dB settings are relative to the full scale setting of the variable attenuator for any setting of the step attenuator.

FRONT PANEL CONTROLS

3.04 The front panel controls, indicators and connectors shown in Figure 1-1 are listed in Table 3-1. The seven knobs just below the MHz display window are used to dial in a frequency. They are referred to in the text as Frequency Selectors. Operating controls for the plug-in units are described in the instruction manuals for those units.

TURN ON AND WARM UP

3.05 Plug the power cord into an AC power outlet (115 volts ±10%, 50-400 Hz) and turn on the power to the instrument with the switch on the VOLUME control.

3.06 Allow the instrument to warm up for approximately 15 minutes. This is to allow the crystal oven to come up to temperature. If the instrument has been stored at temperatures below 32°F additional warm up time may be required. The crystal oven is on whenever the power cord is connected to an AC source. If the instrument is left plugged in with the power switch OFF, the oven will be maintained at operating temperature and the instrument will be ready for use a few seconds after the power switch is turned on.

FREQUENCY DEVIATION MEASUREMENT

3.07 In the following procedure it is assumed that the RF plug-in is either a Model 303 Broadband Mixer or one of the Preselectors operating in the broadband mode. In the Preselector mode the procedure is the same except that the Preselector dial must be set to the frequency dialed in on the Monitor. The Model 301 Oscilloscope or the Model 302 Deviation Meter must be plugged into the left-hand compartment of the Monitor.

3.08 Make the following connections and control settings:

a. Turn instrument on and allow time for warm-up. Refer to paragraphs 3.05 and 3.06.

b. Connect an external antenna, or the telescoping antenna supplied with the instrument, to the ANT connector on the RF plug-in. If the telescoping antenna is used extend it to its full length for HF measurements to approximately 18 inches for VHF and minimum length for UHF measurements.

c. Turn the FUNCTION switch to CAL and adjust the inner knob (on FUNCTION switch) for a zero (mid-scale) reading on the FREQUENCY meter.

d. If a Model 301 Oscilloscope is being

Table 3-1. Controls, Indicators and Connectors

ITEM	DESCRIPTION
FREQUENCY meter	Indicates received or generated signal error above or below the dialed in frequency.
kHz, 1.5, 5, 15	Range switch for FREQUENCY meter. Indicates full scale ranges in MONITOR function only. In SIG GEN range is ±5 kHz only. In CAL range is ±1.5 kHz only.
SIGNAL LEVEL Indicator Light	Lights when a received signal is strong enough for reliable measurements in MONITOR function only. Meter circuits disabled when not lighted. Is lighted but has no signal level significance in other FUNCTION switch positions.
FUNCTION	
CAL	The FREQUENCY meter to be zeroed with the inner knob of the FUNCTION switch. FREQUENCY meter range is automatically ±1.5 kHz.
MONITOR	Receive-Monitor operation. Both carrier frequency and FM deviation of the received signal may be measured. With Model 313 plug-in the AM percentage of modulation may be measured.
SIG GEN	Signal Generator operation. The output frequency is the same as the dialed in frequency. Type of signal generated depends on setting of MODE switch. Modulation or deviation measured by plug-ins.
OVEN ON Indicator Light	On after oven warms up, when connected to AC power.
UNLOCKED Indicator Light	When lighted, indicates an unlocked condition in the Frequency Synthesizer.
MHz Frequency Selector Switches	Each frequency selector knob is associated with a lighted number indicating the dialed in frequency in MHz with reference to the fixed decimal point.
MONITOR	
100 kHz IF OUTPUT connector	100 kHz ± error of signal being received or generated. For connection to a Frequency Counter to give greater resolution in reading frequency.
DEMOD OUT connector	Demodulated output of FM signals.
DE-EMPHASIS switch	Switches in FM De-emphasis network as required.
PWR OFF/VOLUME	Counterclockwise turns off AC power. Clockwise turns on AC power and controls level to internal speaker.

Table 3-1. Controls, Indicators and Connectors (continued)

ITEM	DESCRIPTION
SIGNAL GENERATOR MODULATION	
MODE switch	Selects type of signal generated, AM, CW, FM.
INTERNAL FREQUENCY switch	Selects frequency of internal modulation, 400 Hz, 1000 Hz, or turns internal modulation off.
MOD ADJ control	Adjusts AM percentage of modulation or FM frequency deviation according to setting of modulation MODE switch.
FM CAL control	Adjusts center frequency of generated signal when in the FM mode according to reading on the FREQUENCY meter. Meter range is automatically ±5 kHz. Center frequency may be offset up to ±5 kHz if desired.
MOD INPUT connector	Input for external tone modulation. Signal modulated whenever tone applied to this input. Both internal and external modulation may be used at the same time if desired.
MOD OUTPUT connector	Buffered output of modulation used, internal of external.
SIGNAL GENERATOR LEVEL	
MICROVOLTS, X1, X10, X100	Step attenuator. Selects microvolts multiplier to be applied to the outer scale on the variable attenuator.
MILLIVOLTS, X100, X1000	Step attenuator. Selects millivolts multiplier to be applied to the outer scale of the variable attenuator.
.1-1.0	Variable attenuator. Scale to be multiplied by setting of step attenuator.
-dB	dB scale relative to full scale setting of variable attenuator for each multiplier range.
OFF	Switch on variable attenuator. Turns off output power only while remainder of instrument circuits remain on.
0-1000 MHz W/40 dB PAD	Low level signal output for full frequency range. 40 dB pad must be connected for attenuator calibration to apply. Output for microvolts settings of step attenuator only.
0-200 MHz	High level output for restricted frequency range. Output for millivolts settings of step attenuator only. Calibrated for output directly at connector.

used, set the toggle switches for Horizontal and Vertical inputs to the INT. position and adjust the VERT. POS. control so that the trace is on the zero reference line while the Deviation range switch is in the ±1.5 kHz position. Adjust the INTENSITY, FOCUS and ASTIGMATISM control for a sharp clear trace on the screen.

e. Change the FUNCTION switch to the MONITOR position and dial in the assigned frequency of the transmitter with the seven Frequency Selector dials.

f. Key the transmitter. The SIGNAL LEVEL light should come on. If it does not, move the Monitor closer to the transmitter until the received signal is strong enough to turn on the light. Measurements can usually be made when the Monitor is between 25 and 50 feet from the radiating antenna. When a Preselector plug-in is used measurements can be made many miles from the transmitter providing an adequate antenna is used.

g. The FREQUENCY meter reading is the difference between the assigned frequency (dialed in) and the actual transmitter radiated frequency. Select the lowest meter range that will give an on-scale reading. For greater resolution connect a Frequency Counter to the 100 kHz IF OUTPUT connector. The counter will read 100 kHz ± the frequency error.

h. Modulate the transmitter and read the FM deviation on the FM DEVIATION meter or the Oscilloscope. Select the appropriate meter or oscilloscope range. On the oscilloscope screen peaks appear above and below the horizontal center line of the display. The Deviation Meter indicates either positive or negative peaks depending on the setting of the FM DEVIATION PEAKS switch. If the DEVIATION PEAKS indicator level on the Deviation Meter plug-in has been set all modulation peaks that exceed this level will cause the indicator to light. Refer to paragraph 2.05 for use of the SHARP-WIDE switch on the RF plug-in unit in the presence of strong RF fields.

i. Adjust the MONITOR VOLUME control for the desired level output of the demodulated FM through the speaker. Set the MONITOR DE-EMPHASIS switch to IN or OUT as desired. The demodulated output is also available at the DEMOD OUTPUT connector. The output at this connector is affected by the de-emphasis network but not by the volume control.

AM MEASUREMENT

3.09 Plug the Model 313 AM Monitor into the right hand compartment and follow the procedure of paragraph 3.08 a-c and e-g. Modulate the transmitter (AM) and read the percentage of modulation on the Model 313 meter. Modulation range is 0-100%. The demodulated output may be monitored with the speaker in the plug-in (adjust SPEAKER volume control) or the DEMOD OUT connector on the front panel of the plug-in.

SIGNAL GENERATOR OPERATION

3.10 CW OUTPUT

a. Turn instrument on, refer to paragraphs 3.05 and 3.06.

b. Set the FUNCTION switch to SIG GEN and set the seven Frequency Selector dials to the desired frequency.

c. Set the MODE switch to CW.

d. Turn the INTERNAL FREQUENCY switch to OFF. Make certain that no external signal is connected to the MOD INPUT connector.

e. Set the SIGNAL GENERATOR LEVEL MICROVOLTS/MILLIVOLTS and variable attenuator controls for the desired output. Connect the instrument to be tested to the proper output connector. The 40 dB pad should be used on the 0-1000 MHz output, otherwise the MICROVOLTS level calibration will not apply. MILLIVOLTS calibration applies directly to the 0-200 MHz output level at the connector. Refer to paragraph 3.03.

CAUTION

Whenever a direct connection is made between the CE-6 and a transceiver, keying the transceiver will damage the 40 dB fixed attenuator and possibly the CE-6. A fuse is mounted in the 40 dB attenuator as a protective measure. There is a fuse also in the output of the 0-200 MHz amplifier.

3.11 FM OUTPUT

a. Turn CE-6 on, refer to paragraphs 3.05 and 3.06.

b. Set the FUNCTION switch to SIG GEN and set the seven Frequency Selector dials to the desired frequency.

c. Set the SIGNAL GENERATOR MODE switch to FM.

d. Set the INTERNAL FREQUENCY switch to the desired modulation frequency, 400 Hz or 1 kHz or set it to OFF if external modulation is to be used. For external modulation connect the external source (60 Hz to 20 kHz) to the MOD INPUT connector. The external source may be a single tone or several tones summed together. Both internal and external modulation may be used simultaneously if desired.

e. Adjust the SIGNAL GENERATOR FM CAL control for a zero reading on the FREQUENCY meter. This adjustment sets the FM center frequency to the same frequency that is dialed in on the Frequency Selector switches. Full scale meter range in SIG GEN is ±5 kHz. The center frequency may be offset up to ±5 kHz for test purposes if required.

f. Use the SIGNAL GENERATOR MOD ADJ control to set the frequency deviation. Deviation may be read on the Model 301 Oscilloscope or the Model 302 Frequency Deviation plug-in. The modulation signal applied to the modulator may be monitored at the MOD OUTPUT connector.

g. Set the SIGNAL GENERATOR LEVEL MICROVOLTS/MILLIVOLTS and variable attenuator controls for the desired output level and connect the instrument to be tested to the proper output connector. The 40 dB pad should be used on the 0-1000 MHz output connector, otherwise the MICROVOLTS level calibration will not apply. MILLIVOLTS calibration applies directly to the 0-200 MHz output at the connector. Refer to paragraph 3.03. Observe CAUTION note of paragraph 3.10e.

3.12 AM OUTPUT

a. Install a Model 313 AM Monitor in the right hand compartment of the CE-6. (AM signals may be generated without the Model 313 but percentage of modulation can not be monitored.)

b. Turn the CE-6 on, refer to paragraphs 3.05 and 3.06.

c. Set the FUNCTION switch to SIG GEN and set the seven Frequency Selector dials to the desired frequency.

d. Set the SIGNAL GENERATOR MODE switch to AM.

e. Set the INTERNAL FREQUENCY switch to the desired modulation frequency, 400 Hz or 1 kHz or set it to OFF if external modulation is to be used. For external modulation connect the external source (60 Hz to 20 kHz) to the MOD INPUT connector. The external source may be a single tone or several tones summed together. Both internal and external modulation may be used simultaneously if desired.

f. Adjust the SIGNAL GENERATOR MOD ADJ control for the percentage of modulation. Read percentage on Model 313 meter. The modulation signal applied to the modulator may be monitored at the MOD OUTPUT connector.

g. Set the SIGNAL LEVEL MICROVOLTS/MILLIVOLTS and variable attenuator controls for the desired output level and connect the instrument to be tested to the proper output connector. The 40 dB pad should be used on the 0-1000 MHz output connector, otherwise the MICROVOLTS calibration level will not apply. MILLIVOLT calibration applies directly to the 0-200 MHz output at the connector. Refer to paragraph 3.03. Observe CAUTION note of paragraph 3.10 e.

SECTION 4
THEORY OF OPERATION

INTRODUCTION

4.01 In this section the Circuit Reference Series for circuit and component identification is explained, the overall functioning of the Monitor is described followed by an overall description of the Frequency Synthesizer and finally a description of the operation of the individual boards is given.

4.02 CIRCUIT REFERENCE SERIES

4.03 The circuits of the instrument are referred to by the series 1000 through 5000. The major groupings are:

1000 - Front Panel
2000 - Main Chassis, Left Side
3000 - Microwave Casting (Center)
4000 - Main Chassis, Right Side
5000 - Rear Panel

Right and left sides refer to the instrument viewed from the front in an upright position. Board circuits 2100-2800, 3100, 4100, and 4300-4800 are mounted in the main chassis while board circuits 3200-3900 are mounted in the center casting. The center casting covers are labelled with the circuit board locations. The main chassis circuit board locations are marked on the bottom cover.

4.04 Under each main grouping the circuits are further divided into 100 number groups, and in three cases into 50 number groups (3050, 3450, 3750). These groups usually represent circuit boards, most of them plug-in boards. On each circuit board the components are individually numbered in a series starting with 1, each type of component having a separate series. The complete reference to any component includes the circuit reference number, the individual component number and the type indicator. For example the resistor, R1, in circuit 2100 will be R2101. The transistor, Q2, will be Q2102, etc.

4.05 When the individual circuits are being described in the Circuit Description section the references will be abbreviated and only the circuit component number will be used, except when a reference is made to a component outside of that circuit. In this case the full circuit reference series number will be used.

4.06 Each board is marked with a circuit board number. The circuit reference numbers and the circuit board numbers are cross referenced in Table 6-1.

FUNCTIONAL DESCRIPTION

4.07 The CE-6 Communications Monitor functions on the principle of a superheterodyne receiver. The RF front end consists of various plug-in units. A Frequency Synthesizer generates a Local Oscillator (LO) signal that is both stable and accurate. The Intermediate Frequency (IF) generated in the RF plug-in is 10 MHz and mixing always takes place on the high side. (The LO is 10 MHz higher in frequency than the received signal.)

4.08 In the Signal Generating function the signal that was used for the LO is now shifted down by 10 MHz and used as the signal output. This automatically takes place whenever the FUNCTION switch is placed in the SIG GEN position.

4.09 All the fixed frequencies are derived from a very stable 5 MHz crystal oscillator mounted in a temperature controlled oven. The variable frequencies are phase locked to a frequency derived from the crystal oscillator so that the accuracy of the crystal oscillator is maintained in the LO and the output frequency. Refer to the overall Block Diagram Figures 4-4 and 4-5.

4.10 The received signal is brought into the Monitor through the plug-in front end. This may be a Broad Band Mixer or an RF tuned Preselector. In either case the input frequency is mixed with the LO to generate a 10 MHz IF as the output of the plug-in. In the Monitor the 10 MHz IF is mixed with a 9.9 MHz fixed LO to generate a 100 kHz second IF. Since both LO signals are standards generated by the synthesizer, the frequency error, if any, will appear on the second IF signal. Frequency error detector circuits display this error on the FREQUENCY meter which is calibrated directly in kHz.

4.11 The modulation (FM) is recovered and the deviation measured either with the Oscilloscope or Deviation Meter plug-in. The audio modulation is displayed on the Oscilloscope and reproduced in the speaker.

4.12 In the Signal Generator mode the output may be modulated (FM or AM) by internally generated tones (1000 Hz or 400 Hz) or an external signal (60 Hz to 20 kHz) may be used or both internal and external modulation may be used simultaneously.

4.13 FREQUENCY SYNTHESIZER

4.14 The circuits of the Frequency Synthesizer make up the major portion of the instrument. Frequency generation starts with the Crystal Controlled Master Oscillator (MO). The MO provides two 5 MHz outputs, one to the Reference Divider circuit, 2700, and one to the Frequency Multiplier circuit, 2600. These circuits furnish the fixed frequencies required. See Block Diagram Figure 4-4.

4.15 The four least significant digits, 100 kHz, 10 kHz, 1 kHz, 100 Hz of the frequency selector switches control a 20-21 MHz Voltage Controlled Oscillator (VCO) in a phase locked loop which varies the frequency in 100 Hz steps from 20 MHz to 20.9999 MHz. This is accomplished by the circuits 100 Hz ÷N, 4100, 100 Hz VCO, 4300, and 100 Hz multi-mixer, 4500. Since a X10 multiplication of the signal takes place later on, this oscillator output is divided by 10 to make the circuit output 2-2.09999 MHz. See Overall Block Diagram Figure 4-4.

4.16 The 2-2.09999 MHz frequency is mixed with either 20 MHz or 21 MHz in the 17.9-19 MHz mixer, 4600, to produce 17.90001-18 MHz or 18.90001 to 19 MHz. 21 MHz is used in the Signal Generator mode and 20 MHz in the Receive Monitor mode. This 1 MHz difference is changed to 10 MHz in the X10 multiplier later on to provide the 10 MHz difference required between the Signal Generator output and the Receive Monitor LO.

4.17 The 20 MHz for mixing is obtained from the Frequency Multiplier circuit, 2600. To obtain the 21 MHz, a 10 MHz output from the Reference Divider, 2700, through the 10 MHz modulator, 4400, is brought to the 17.9-19 MHz mixer, 4600, divided by 10 and mixed with the 20 MHz signal to produce the required 21 MHz. These frequencies are switched on as necessary.

4.18 Output from the 17.9-19 MHz mixer is connected to the 142.9-144 MHz mixer, 2400, where it is mixed with a fixed frequency of 125 MHz obtained from the Frequency Multiplier, 2600. Output from this mixer is 143.9-144 MHz (Sig Gen) or 142.9-143 MHz (Rec Mon).

4.19 The output from the 142.9-144 MHz mixer is connected to the 119-130 MHz mixer where it is mixed with 14-23.9 MHz from the VCO phase lock loop controlled by the 10 MHz and 1 MHz digits of the Frequency selector switch. Output from this mixer is either 120-130 MHz (Sig Gen) or 119-129 (Rec Mon).

4.20 The 14-23.9 MHz frequency generator is made up of three circuits; 100 kHz VCO, 2200, 100 kHz ÷N, 2300, and 100 kHz Phase Detector, 2500. This phase locked loop which is controlled by the 10 MHz and 1 MHz digit switches and is referenced to the 100 kHz output of the Reference Divider, 2700, generates a frequency variable in 100 kHz and 1 MHz steps. Because of the later X10 multiplication these steps become 1 MHz and 10 MHz in the monitor output.

4.21 The output of the 119-130 MHz mixer goes to the 1190-1300 Phase Lock Loop, 3750, and oscillator, 3700, in the Microwave Casting where it serves as the Reference frequency. A Microwave Oscillator is locked to the 10th harmonic of this Reference frequency.

4.22 The output of the Microwave Oscillator is connected to the voltage controlled attenuator (VCA), which is made up of a series of PIN diodes. These diodes can be used to amplitude modulate the Oscillator output when in the SIG GEN mode. They also serve to attenuate the output signal and are controlled by the variable and step attenuator switches on the front panel. Output from the VCA goes to the Microwave mixer, 3500, where the final mixing takes place.

4.23 The other frequency required for the final mixing is generated by the 1300-2200 MHz oscillator, 3800, and phase lock, 3900. The reference is the 100 MHz output of the Frequency Multiplier, 2600, and the oscillator is controlled in 100 MHz steps by the most significant digit, 100 MHz, switch of the Frequency Selector dials Individual oscillators are phase-locked to the 13th through the 22nd harmonic of 100 MHz.

4.24 The final microwave mixer output will be 10 kHz to 999.9999 MHz in the Signal Generator mode and 10-1009.9999 MHz in the Receive Monitor mode. This latter signal serves as the L.O. frequency for the RF plug-in.

4.25 Internal modulation in SIG GEN is either 1000 Hz or 400 Hz, selected by the front panel MODULATION FREQUENCY switch. For AM the modulating signal is routed through the Attenuator Control circuit, 3100, to the VCA circuit, 3600, where it controls a PIN diode modulator. For FM the modulating signal is applied to a VCO in the 10 MHz modulator circuit, 4400. The FM CAL control also is connected to the VCO so that the center frequency may be set exactly on by using the Monitor FREQUENCY meter. A feedback loop from the Modulator output is connected to the discriminator in the Second IF Discriminator, 4700, to provide an AFC voltage which is also connected to the VCO in the modulator. An RF plug-in must be in the right hand compartment to complete the loop. The FM modulated 10 MHz output of the modulator goes to the 17.9-19 MHz mixer circuit where it is divided by 10 and mixed with the 20 MHz input to provide the 21 MHz mixing frequency required by this mixer for Signal Generation. In this way the output frequency is modulated. External modulation is accomplished in the same way with an external modulating signal.

4.26 In the 1190-1300 MHz oscillator, 3700, 3750, to make sure that phase lock takes place at the proper frequency, a steering voltage is required to bring the frequency within locking range. This is supplied by the Reference Voltage, 1190-1300 MHz circuit, 2800, which is controlled by the 1 MHz and 10 MHz switches of the Frequency Selector dials.

CIRCUIT DESCRIPTION

4.27 REFERENCE DIVIDER. 2700

4.28 In this circuit, Figure 6-11, the 5 MHz output from the Crystal Oscillator Time Base is processed to provide most of the fixed frequencies required for frequency synthesis. Outputs from this

board are: 9.9 MHz for the second IF and 100 Hz Multi-Mixer circuits, 10 kHz to the Amplifier-Generator, 1 kHz Reference 20% duty cycle to the Multi-Mixer, 1 kHz 50% duty cycle to the 10 MHz modulator, 100 kHz Reference 20% duty cycle to the 100 kHz Phase Detector, and 10 MHz to the 10 MHz Modulator. How these frequencies are obtained is explained in the following paragraphs.

4.29 5 MHz Time Base output is divided by 5 in IC1 and by 10 in IC2 to obtain 100 kHz. Outputs IC2-8 and IC2-12 are buffered and combined in an AND gate in IC3 to produce a 20% duty cycle 100 kHz output to board pin 8. The other gates of IC3 are connected as buffers.

4.30 The 100 kHz output of IC2 is divided by 10 in IC4 and the 10 kHz output is inverted in IC6 and brought out at board pin 4. The 10 kHz output of IC4 is divided by 10 in IC5. Outputs IC5-8 and IC5-12 are combined in an AND gate in IC6 to produce a 20% duty cycle 1 kHz output through board pin 2. Output IC5-12 is inverted in IC6 and brought out as a 50% duty cycle 1 kHz output through board pin 6.

4.31 100 kHz from IC2 is connected through a buffer IC3-4, 5, 6 to the input of the 3.3 MHz tuned amplifier, Q2, Q4, Q5, Q8 where the thirty-third harmonic is selected and amplified. Tuned amplifier, Q9, selects and amplifies the third harmonic of 3.3 MHz to produce a 9.9 MHz output at board pin 21.

4.32 An output from the 5 MHz Time Base is also connected to one side of an AND gate in IC7. The other side of the AND gate is connected through the Function switch S1007 to the Modulation MODE switch S1004A. In the AM and CW modes the gate is opened and closed in the FM mode. The 5 MHz thus controlled is connected through the buffer amplifier of IC7 to the full wave rectifier doubler T1, Q6, Q7. The doubler output is passed through a 10 MHz filter to provide the 10 MHz output at board pin 16.

4.33 FREQUENCY MULTIPLIER. 2600

4.34 This circuit, Figure 6-10, furnishes the other three fixed frequencies required for frequency synthesis, 20 MHz to the 17.9-19 MHz mixer, 125 MHz to the 142.9-144 MHz mixer and 100 MHz as a reference for the 1300-2200 MHz phase lock.

4.35 Input to the circuit is 5 MHz from the Time Base. This sine wave input is amplified and shaped in Q1, Q2, IC1 to produce a 5 MHz pulse. This pulse is applied to the inputs of the X4 and X5 harmonic amplifiers. Q3, Q6, Q8 is a tuned amplifier that selects and amplifies the fourth harmonic to produce a 20 MHz output at board pin B. In the same manner the tuned amplifier, Q4, Q5, Q7, Q9, selects and amplifies the fifth harmonic to produce a 25 MHz output which is connected to the input of another set of X4 and X5 harmonic amplifiers. Q10, Q12, Q14, Q16 amplify the fourth harmonic to produce 100 MHz output at board pin N. Q11, Q13, Q15, Q17, amplify the fifth harmonic to produce 125 MHz output at board pin Y.

4.36 100 Hz LOOP

4.37 The 100 Hz Loop is made up of three circuits, the 100 Hz VCO, 4300, 100 Hz ÷N, 4100 and 100 Hz Multi-Mixer, 4500. Figures 6-27, 6-26, 6-29. The operation of the 100 Hz Loop is shown in the Block Diagram of Figure 4-1. The following description is in reference to this figure.

4.38 The VCO output may range from 20.000 MHz to 20.9999 MHz. This is shifted down in frequency by mixing with a fixed frequency of 19.8 MHz which is obtained by multiplying the 9.9 MHz from the Reference Divider by two. The frequency now is 200 kHz to 1.1999 MHz. This frequency is applied to the ÷N circuit which has a division range of 2000 to 11,999 depending on the setting of the four least significant Frequency Selector dial switches. It can be seen that 200 kHz ÷ 2000 and 1.1999 MHz ÷ 11,999 both equal 100 Hz. Thus for any setting of the four least significant digits (LSD) of the Frequency Selectors, the VCO is able to generate a frequency that can be divided by N to produce 100 Hz. The function of the remainder of the 100 Hz Loop is to cause the VCO to generate the desired frequency and have it referenced to a standard output from the Reference Divider (100 Hz) to maintain frequency accuracy.

4.39 Output of the ÷N circuit is used as the sampling pulse in the two Sample and Hold circuits, one sample having a definite time delay. The first sample is taken of a ramp voltage. 1 kHz from the Reference Divider is divided by 10 and used to generate a ramp voltage with a 100 Hz repetition rate. This ramp voltage is sampled by the 100 Hz from the ÷N circuit and the sample is stored on a capacitor. This is a DC voltage with an amplitude depending on the time at which the ramp is sampled. Since the sampled voltage has a slight slope due to the slope of the ramp, the stored voltage is amplified with a DC amplifier and the output sampled again at a later time when the stored level is constant. This prevents frequency jitter. This second sample is stored and becomes the DC voltage control of the VCO, after going through an offset in the search amplifier and being summed with the D to A output voltage. This voltage brings the VCO to a frequency that causes a 100 Hz output from the ÷N circuit. At this point the loop is in lock and referenced to the Time Base, and remains in this state until the LSD dials are reset.

4.40 An AND gate, with a 100 Hz Band Pass Filter connected to one input, senses the ÷N output. See Figure 4-1. If the frequency deviates more than a few percent from 100 Hz the gate closes and the circuit goes into the search mode. This prevents locking up on the wrong frequency, such as a sub-multiple of 100 Hz.

4.41 The search circuit is normally disabled. If the VCO is thrown out of the hold range by switching frequencies, the search circuit is enabled and puts out a voltage that causes the VCO to sweep across the range until it reaches the proper frequency to cause lock to occur. At this point the loop gain of the phase locked circuit disables the search circuit.

4.42 The 100 kHz Frequency Selector dial also controls a Digital to Analog circuit that produces a voltage that brings the VCO close to the proper frequency when this dial is changed to ensure the selection of the proper 100 kHz range. Σ is the summation point for the different voltages that control the VCO, see Figure 4-1.

4.43 The 20-20.9999 MHz output of the VCO, variable in 100 Hz steps, is divided by 10 to provide the 2-2.09999 MHz output, variable in 10 Hz steps, that is required by the 17.9-19 MHz mixer.

4.44 100 Hz ÷N. 4100

4.45 This circuit, Figure 6-26, and 4-1, sets up the division ratio for the input signal so that the output will be 100 Hz when the input signal is the correct frequency according to the setting of the four least significant figures on the dials of the Frequency Selector switches. Four decade dividers, IC1-IC4 and a divide-by-two, IC5 perform the necessary division. Exclusive-OR gates IC6-IC9 and IC12 make the comparison between the Frequency Selector switch settings and the counter outputs. The coincidence of these gates is sensed by the AND gate, IC10. The most significant digit negative BCD to excess-2 converter is made up of IC14, IC15. The reset pulse and output pulse are generated by one-shot multivibrators, IC11, IC13.

4.46 The Exclusive-OR gates produce an output only if the inputs are unequal. For this reason the Frequency Selector switches must be wired up for inverted BCD. For instance if the number 4 is dialed in (BCD 0100) the switch output must be 11 (BCD 1011) for the Exclusive-OR gates to produce an output. This inverted format is 15-X (where X = dialed in number). See Table 4-1.

4.47 Since the lowest division ratio is 2000, paragraph 4.38, Figure 4-1, when the most significant digit (MSD) is set to zero (four lowest dials set to 0000) the counter must count to 2000. To accomplish this IC14, IC15 convert the inverted BCD from the switches to Excess-2 inverted BCD. See Table 4-1.

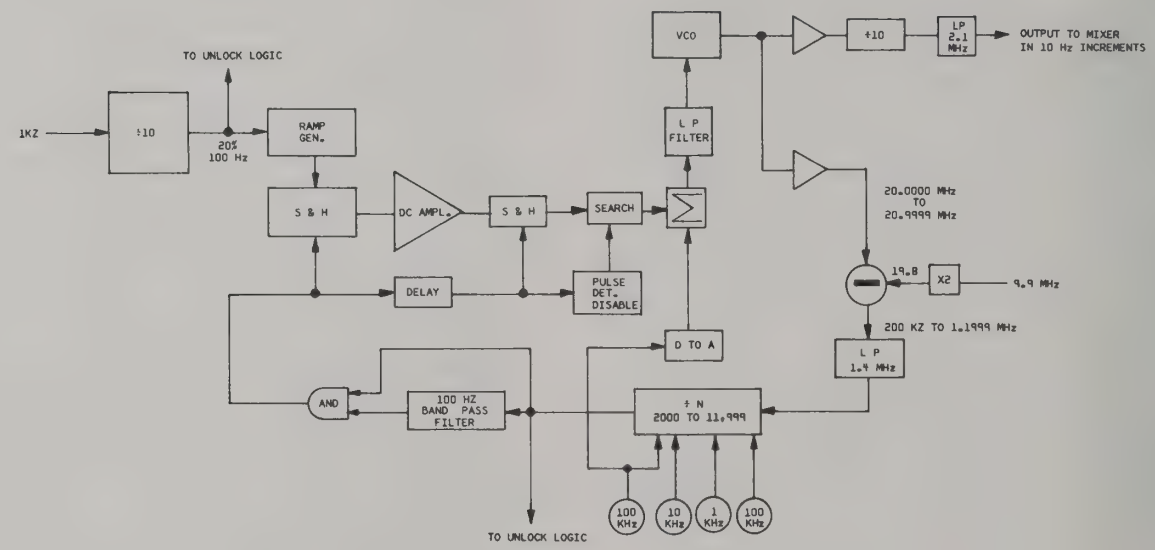

Figure 4-1. 100 Hz Loop Block Diagram

Table 4-1. BCD, Inverted BCD and Excess-2 Inverted BCD Codes

Dialed In Decimal	BCD (Counter Output) (8)	(4)	(2)	(1)	Inverted Decimal	Inverted BCD (Switch conn.)				Exess-2 Decimal	Excess-2 Inverted BCD (to IC9)				Excess-2 Inverted Decimal
0	0	0	0	0	15	1	1	1	1	2	1	1	0	1	13
1	0	0	0	1	14	1	1	1	0	3	1	1	0	0	12
2	0	0	1	0	13	1	1	0	1	4	1	0	1	1	11
3	0	0	1	1	12	1	1	0	0	5	1	0	1	0	10
4	0	1	0	0	11	1	0	1	1	6	1	0	0	1	9
5	0	1	0	1	10	1	0	1	0	7	1	0	0	0	8
6	0	1	1	0	9	1	0	0	1	8	0	1	1	1	7
7	0	1	1	1	8	1	0	0	0	9	0	1	1	0	6
8	1	0	0	0	7	0	1	1	1	0	1	1	1	1	15
9	1	0	0	1	6	0	1	1	0	1	1	1	1	0	14

4.48 The highest division ratio is 11,999, but the counter will count up to only 9999. To reach the maximum count necessary a divide by 2, IC5, and Exclusive-OR gate, IC12, are used. As long as the MSD on the Frequency Selector switch is set from 0-7 the output from this switch to IC12-1 is a "1" through board pin 17. See Table 4-1 first column of INVERTED BCD. In this case the counter will never go higher than 9999 (7999 + 2000), and the output of IC5-8 to IC12-9 will be "0". In this case the output of IC12 will be "1" to IC11-3, 4 and whenever there is a coincidence at the input of IC10 the "1" output to IC11-1, 2 will trigger IC11, generating a reset pulse to the counter, a clear pulse to IC5-2 and an output pulse through IC13 to board pin 20.

4.49 When the MSD switch is set to 8 or 9 the output from this switch through pin 17 will be "0" (Table 4-1) and therefore IC12-1 will be "0" causing the output of IC12-6 to be "0". This will call for a count of 10,000 or higher (8000 + 2000). In this case the counter will count up through 9999 and start over again for the rest of the count. No reset pulse will be generated on this first count because IC11-3, 4 is "0" (IC12-6 is "0".) When the count reaches 9999, IC5 will change state and IC5-8 and IC12-9 will become "1" making IC12-6 "1" and IC11-3, 4 a "1". When the counter reaches the remainder of the count above 9999 for which it is set a coincidence will take place at the input of IC10 which will generate an output "1" to trigger IC11, generating a reset pulse at IC11-8 and an output pulse at IC13-8.

4.50 100 Hz VCO. 4300

4.51 100 Hz Reference, 20% duty cycle, from the decade divider on the Multi-mixer board, 4500, through board pin 4 controls the ramp generator Q5, Q7 to produce a negative going 80% duty cycle ramp which is referenced to the Time Base. See Figure 6-27. 100 Hz from the ÷N circuit controls the sampling gate, Q8, through amplifiers Q10, Q12. The sample is stored as a DC level on C21. The very high input impedance of Q15 prevents discharge of C21. There is a slight ripple on this voltage level due to the slope of the sampled ramp. To prevent this ripple from causing frequency jitter the level is amplified by Q15, Q16 and sampled at times that fall in between the times of the first samples. The same 100 Hz sampling pulse from the ÷N circuit is passed through a delay circuit made up of two one-shots in series, IC1. The first is triggered by leading edge of the input pulse while the second is triggered by the lagging edge of the output of the first one-shot. This introduces the required delay and the delayed pulse controls the second sampling gate, Q17, through amplifiers Q18, Q22. The sampled level is stored on C32 and source follower buffer amplifier, Q24, connects this level to differential amplifier Q9, Q11.

4.52 The delayed sampling pulse at the collector of Q18 is also connected to CR2 where it is rectified and stored on C8 as a positive voltage due to the high impedance of R16. As long as there is a sampling pulse present this positive voltage keeps Q6 cut off and Q9, Q11 act as a differential amplifier. The amplifier output level is applied to the varicaps, CR6, CR7 through Q13, to control the frequency of oscillator Q20.

4.53 When the 100 Hz frequency out of the ÷N circuit falls outside the band pass of the 100 Hz sense circuit (paragraph 4.40), 100 Hz sampling pulses are cut off and C9 discharges through R16. This turns on Q6 and a positive voltage is applied to the base of Q9. Due to the feedback through Q14 and C20, the circuit now operates as a Wien bridge oscillator, and starts to oscillate at a very low frequency. This output is applied to the varicaps CR6, CR7 of the VCO, Q20, causing it to vary over its full range of 20-21 MHz. As soon as

it passes through the correct frequency, a sampling pulse again appears, Q6 is cut off, Q9, Q14 stop oscillating due to the very high gain of the locked phase loop and the circuit is locked on frequency.

4.54 Q1-Q4 are switches controlled by the 100 kHz dial of the frequency selector to apply the proper voltage to the summing junction, R28, R29 to bring the VCO within locking range for every frequency dialed up. Q1-Q4 with associated resistors make up the Digital/Analog dial control.

4.55 Q13 is a low pass active filter between the summing junction and the VCO varicaps. Q19 is the output buffer amplifier for 20-21 MHz to board pin 19. Q21, Q23 form a differential buffer amplifier to the input of decade divider IC2. The 2-2.1 MHz output of IC2 is connected through a low pass filter to board pin 21.

4.56 100 Hz, MULTI-MIXER. 4500

4.57 Three separate functions are performed by the circuits on this board. See Figure 6-29. A 1 kHz signal from the Reference Divider is connected through pin 2 to the decade divider, IC1. Two outputs from the divider to IC2-1, 2 form a 100 Hz, 20% duty cycle pulse which is inverted in the remaining circuits of IC2 and goes through board pin 4 to board 4300 to control the Ramp Generator.

4.58 9.9 MHz from the Reference Divider is connected through board pin 19 to the X2 Multiplier, Q2, Q3, through transformer, T1. Q1 is connected as a diode to provide constant bias to the bases of Q2, Q3. 19.8 MHz output of the X2 multiplier is connected to T2 of the mixer, which is made up of T2, T3, CR1-CR4. The 20-21 MHz signal from the VCO is connected through board pin 21 to a buffer amplifier, Q6, and then to the mixer transformer, T3. The 0.2-1.2 MHz output from the mixer passes through the 1.4 MHz low pass filter, L9, L10, C26, C27 to the output buffer amplifier, Q4, and then through board pin 17 to the input of the 100 Hz ÷N board, 4100.

4.59 Output from the ÷N board is connected through board pin 6 to the pulse shaper, IC4-11, connected as a one-shot to set up a 50% duty cycle pulse. The output pulse goes to the input of IC3 which is connected as an active 100 Hz narrow band filter. R10 adjusts the center frequency of the filter. Output from the filter is connected to protective diode, CR5, and switch, Q5. When the ÷N output is close enough to 100 Hz to pass through the filter, Q5 is turned on, IC4-7 is low which allows the 100 Hz input at IC4-6 to pass through to the inverter IC4-3, 4, 5 and out through board pin 7 to the Sample and Hold circuits of the 100 Hz VCO, 4300. If the ÷N output falls outside the 100 Hz filter bandwidth there will be no output to Q5, IC4-7 will be high turning it off, so no signal will pass to the 100 Hz VCO and it will go into the search mode as noted in paragraph 4.50.

4.60 17.9-19 MHz MIXER. 4600

4.61 In this circuit, Figure 6-30, the 2.0-2.1 MHz output of the 100 Hz VCO, 4300, is mixed with 20 MHz to produce the 17.9-18 MHz required for the Receive-Monitor function, or 1 MHz is mixed with the 20 MHz to produce 21 MHz, which is then mixed with 2.0-2.1 MHz to produce the 18.9-19 MHz required for the Signal Generator function. The selection of either condition is controlled by diode switches CR9-CR12.

4.62 When the Function switch is in the MONITOR position voltage at board pin 9 is +20V and at pin 7 it is -12V. This turns diodes CR10, CR11 on and diodes CR9, CR12 off. 20 MHz from the Frequency Multiplier, 2600, through pin 8 passes through CR10, CR11 to T2 of the double balanced mixer T1, T2, CR1-CR4, R7, C13, C14. Here it is mixed with 2.0-2.1 MHz to produce 17.9-18 MHz. Output from T1 goes through a 19 MHz low pass filter and the level adjust control, R12, to output amplifier Q5 and the 17.9-19 MHz band pass filter to board pin 21.

4.63 In the SIG GEN or CAL position of the FUNCTION switch input to pin 7 is +20V and to pin 9 it is -12V turning CR9, CR12 on and CR10, CR11 off. 20 MHz is now connected to T4 of the mixer made up of T3, T4, CR5-CR8. The other input comes from the 10 MHz modulator through pin 4 to 10 MHz amplifier, Q2, Q3, and decade divider, IC1, the 1 MHz output of which is connected to T3. Output from T3 is connected to the input of tuned amplifier, Q1. It then passes through the 21 MHz bandpass filter to the tuned amplifier, Q4, through CR12 to the input of T2 in the double balanced mixer. This mixer output is now the 18.9-19 MHz required for the Signal Generator mode.

4.64 142.9-144 MHz MIXER. 2400

4.65 Inputs to this circuit, Figure 6-8, are 125 MHz from the Frequency Multiplier, 2600, and 17.9-18 or 18.9-19 MHz from the 17.9-19 MHz mixer, 4600. These are connected to the balanced mixer T2, T3, CR1-CR4 through Balun transformers T1, T4. The Balun transformers are used to obtain a more accurate balance in the mixer. Mixer output is 142.9-143 MHz or 143.9-144 MHz. It passes through a bandpass filter to the tuned amplifiers Q1, Q2 through board pin B to the 119-130 MHz mixer, 2100.

4.66 119-130 MHz Mixer. 2100

4.67 This circuit, Figure 6-5 is very similar to the 142.9-144 Mixer. Inputs from the 142.9-144 MHz mixer and 14-23.9 MHz from the 100 kHz loop are combined in the balanced mixer T2, T3,

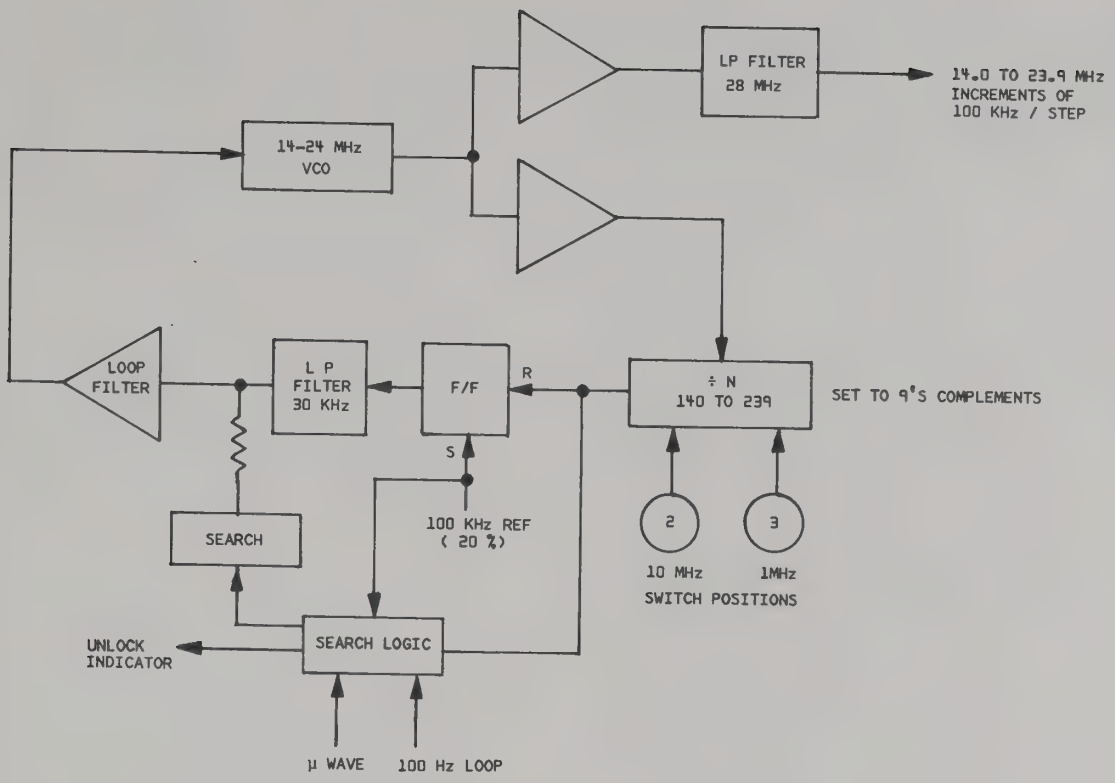

Figure 4-2. 100 kHz Loop Block Diagram

CR1-CR4 through the Baluns T1, T4. 119-130 MHz output passes through a band pass filter to the output amplifiers Q1, Q2 and to board pin Y.

4.68 100 kHz LOOP

4.69 This loop is made up of three circuits, 100 kHz VCO, 2200, 100 kHz ÷N, 2300 and 100 kHz Phase Detector, 2500. The VCO output is variable from 14-23.9 MHz. One output goes to the 119-130 MHz mixer, 2100, the other output goes to the divide-by-N circuit where control by the Frequency Selector 10 MHz and 1 MHz digits is introduced. See block diagram Figure 4-2. Control is in increments of 100 kHz per step, but this is increased to 1 MHz per step in the X10 multiplication which takes place later on. Output of the ÷N circuit is 100 kHz when the VCO frequency is correct. This output is compared with the 100 kHz reference frequency in a Flip-Flop, the output of which is filtered in a low pass filter and integrator amplifier to provide a control voltage for the VCO.

4.70 Search logic detects an unlocked condition of the phase lock loop and generates a ramp voltage at the output of the integrator to sweep the VCO to bring it into the locking range. The search logic also lights the UNLOCKED light whenever the unlocked condition is detected. Signals from all the other loops are summed at this point to indicate an unlocked condition.

4.71 100 kHz VOLTAGE CONTROLLED OSCILLATOR. 2200

4.72 Three oscillators are used to cover the required band of 14-23.9 MHz. See Figure 6-6. They are switched in as needed by the 10 MHz Frequency Selector dial switch. The oscillators are fine tuned by a voltage applied to a pair of varicaps connected in the tuning circuit of each oscillator, the voltage being supplied from the 100 kHz Phase Detector circuit, 2500. The varicaps CR6, CR9 tune the 14-16 MHz oscillator, Q5, CR5, CR8 tune the 17-19 MHz oscillator Q4, and CR4, CR7 tune 20-23 MHz oscillator Q3. Frequency Selector dial digits 0-2 switch in 14-16 MHz, 3-5, 17-19 MHz, and 6-9, 20-23 MHz. The output of the 14-16 MHz oscillator passes through an 18 MHz low pass filter to remove harmonics that could get through the 28 MHz low pass filter in the output. Since only one oscillator is on at a time the outputs all connect to the summing amplifier Q1, Q2. One output through board pin 18 goes to the ÷N circuit, while the other through board pin 21 goes to the 119-130 MHz mixer, 2100.

4.73 100 kHz DIVIDE BY N. 2300

4.74 The purpose of this circuit, see Figure 6-7, is to divide the output of the 100 kHz VCO by a factor that will result in a 100 kHz output when the frequency is correct. Since the VCO output range

must be 14-23.9 MHz the division range must be 140-239. 14-23.9 MHz input goes through a buffer amplifier, Q1, to three gates IC6, one of which, IC6-6 is always enabled. For the beginning portion of the count IC6-12 is enabled and IC6-8 is low. The input through IC6-12 goes to IC3-8, the input of the three decade dividers IC1, IC2, IC3.

4.75 The dividers are preset by the 10 MHz and 1 MHz Frequency Selector switches to the nines complement of the division ratio required. (All counts are in BCD). Thus if the division ratio is 140 (corresponds to a dial setting of 00) the dividers are preset to 999-140=859. For a division ratio of 239 (corresponds to dial setting of 99) the dividers are preset to 999-239=760. Since the most significant digit of the division ratio is only either 1 or 2, IC1 is connected to be set only to the nines complement 7 or 8.

4.76 The dividers start counting from the preset number and then go through the full counting cycle (except IC1) until they are again preset by applying a low to pins 1 of each divider.

4.77 When IC1, IC2 reach a count of 990 pins 5 and 12 are high which enables IC5-8 placing a high on IC7-5. The other two inputs, IC7-4, 3, remain low until IC3 has continued to the count of 3, at which time both pin 5 and 9 go high which now makes IC7-3, 4, 5 high so that at the trailing edge of count 994, IC7 changes state. IC7-6 goes low which resets the dividers IC1, IC2, IC3 and also disables IC6-12. At the same time IC7-8 goes high enabling IC6-8 so that the next count goes to IC4-8 which is permanently preset to 5. Counts 995-998 brings IC4 up to 9 which makes pin 5 and 12 high, making IC7-10, 11 high so that the count of 999 causes IC7 to change state. This disables IC6-8 and enables IC6-12 so that the next count starts a new sequence in IC1-IC3. At the same time IC4 is reset by the low to pin 1. The sequence then repeats. When the input frequency is correct the output from IC7-8 to board pin 19 will be 100 kHz.

4.78 100 kHz PHASE DETECTOR. 2500

4.79 The 100 kHz output of the ÷N circuit and the 100 kHz, 20% duty cycle output from the Reference Divider are brought in through board pins 6 and 4 respectively to set and reset the Flip-Flop (F/F), IC1. Refer to Figure 6-9. The time relationship between these signals will determine the duty cycle of the F/F output. This output is amplified by Q1-Q3 and applied to the input of a 30 kHz low pass filter, the output of which will be a DC voltage proportional to the duty cycle of the F/F output. This output is amplified in IC7 and connected through board pin 19 to the varicaps of the VCO, 2200. CR1 prevents the varicaps from being forward biased if the circuit goes out of lock. R12 adjusts for optimum control range.

4.80 If the circuit goes out of lock the ÷N and the Reference Divider pulses will drift through each other. When these pulses coincide, IC2-11 will change state, triggering the one-shot, IC4, of the search circuit, which will generate an output pulse at IC4-8. This search pulse is applied to IC7 through R11. IC7 is connected as an integrator due to the feedback loop R13, C19. The output pulse of IC4-8 thus causes a ramp output from IC7 which drives the VCO through its range until it comes into the locking range of the phase lock loop.

4.81 In order to prevent another search pulse from being generated while the circuit is locking up, the IC4-6 output is fed back to the input to lock out any additional inputs for the duration of the search pulse. The trailing edge of the search pulse from IC4-8 triggers the one-shot IC6, the output of which is also fed back to the input of IC4 to lock out inputs for the duration of this pulse. Thus input to the search circuit is inhibited for the duration of these two pulses

4.82 Whenever an unlocked condition occurs in either of the 100 Hz, 100 kHz, 1190-1300 MHz or 1300-2200 MHz phase lock loops the VCO frequency or the search output will drift through the reference frequency. This out of lock condition is detected as a coincidence at either IC2-12, 13 or IC3-1, 2, or 3, 4. Whenever this occurs a logic high appears at either or both inputs to IC5-8, 9. This triggers the IC5 one-shot pulse stretcher and the output of IC5-1 closes the switch, Q4, to turn on the UNLOCKED light.

4.83 1190-1300 MHz PHASE LOCK. 3750

4.84 Output from the 119-130 MHz mixer (paragraph 4.67) is connected to the input amplifiers through J1. Refer to Figure 6-22. Q1, Q5 amplify the signal sufficiently to properly operate the step recovery diode, CR2. R38 adjusts the bias on this diode. The step recovery diode acts as a capacitor that, on every cycle, returns the stored charge to the circuit very rapidly. The result is a very sharp pulse of approximately 500psec duration. This pulse is applied to both T1 and CR4. The rectified output of CR4 is connected to the Automatic Level Control Amplifier IC2-4, the filtered DC output of which is connected to PIN diode, CR1. The PIN diode functions as a resistance which may be varied according to the applied bias. Thus CR1 functions as an attenuator controlled by the output of IC2 to produce automatic level control. The reference voltage connected to IC2-5 is determined by the divider R43, R44, with CR3 providing temperature compensation.

4.85 The narrow output pulse from CR2 appears at the output of the secondary of T1 as a positive and a negative pulse (because the secondary center tap is connected to ground). These pulses are applied to the anode and cathode sides of the diode sampling bridge, Z1, to turn it on for a very short time. Since there is a fixed back bias on the bridge determined by CR9 and CR10 only the very narrow upper portion of the pulses turn on the bridge, giving a sampling width of approximately 100 psec.

4.86 The waveform that is sampled is the input from the 1190-1300 MHz VCO, 3700, which is brought in through J2 and connected across the sampling bridge. When the frequency of the VCO is correct every tenth cycle is sampled at exactly the same point on the waveform so the output of the sampling bridge to IC3 is constant. This output is filtered and stored by C35, C45, R55. If the VCO frequency tries to drift sampling takes place at different places on the waveform and the output of the sampling bridge will go up or down depending on the direction of frequency drift.

4.87 DC output from IC3 is amplified by the differential amplifier, IC1, Q2 and the output is applied to the input of amplifier Q3, Q4. When the phase loop is locked, Q3, Q4 function as a differential amplifier, with Q6 not functioning in this mode. Q4 output is amplified by Q7, Q8 to become the varicap control voltage for the 1190-1300 MHz VCO, through board pin 5.

4.88 When the frequency is shifted out of locking range the output of the sampling gate, Z1 will be zero and the input to Q3 will be zero volts. When this occurs, Q3, Q4, Q6 function as a low frequency Wein bridge oscillator causing the VCO to swing through its frequency range. As soon as this frequency comes within the locking range there will be an output from the sampling gate and the loop will be closed. The high loop gain overrides the oscillator gain of Q3, Q4, Q6 and Q3, Q4 return to the amplifying function. R8 is an adjustment to set the input to Q3 at zero volts when there is no output from the sampling gate.

4.89 When the circuit is out of lock, search oscillator output from Q6 is connected through CR11 to Q10 turning it off. The oscillator pulses are stored as a DC level by C12, R27 to hold Q10 off. This low output from Q10 is fed through summing amplifiers Q3910, Q3911, Q3912 to the unlock detector circuit IC2503, IC2505 to turn on the UNLOCKED light.

4.90 An offset voltage from the Reference Voltage 1190-1300 MHz circuit, 2800, is applied to the input of Q9 to set the varicap voltage according to the 1 MHz and 10 MHz Frequency Selector dial settings to bring the VCO into locking range for the frequency selected.

4.91 1190-1300 MHz OSCILLATOR. 3700

4.92 Oscillator Q1 is connected in the common collector configuration and output is taken from the base. See Figure 6-21. The output tuned circuit is formed by the inductance in the board trace and the inductance and capacitance in the varicap, CR1. Frequency is controlled by the output of the phase lock circuit and the offset voltage from the varactor control, 2800, which in turn is controlled by the 1 MHz and 10 MHz Frequency Selector switches. C2 is the coarse frequency adjustment. R4 adjusts the base voltage and the output amplitude. The traces from the emitter, base and varicap to the bypass capacitors are approximately one quarter wavelength and appear as RF chokes to the oscillator circuit. Output is coupled to the buffer amplifier, Q2, through C8. It then passes through a low pass filter, etched on the board, to the Voltage Controlled Attenuator. A directional coupler takes a sample of the oscillator output for the Phase Lock circuit and is connected through J1.

4.93 VOLTAGE CONTROLLED ATTENUATOR. 3600

4.94 Two functions are performed by the Voltage Controlled Attenuator (VCA) circuit, amplitude modulation of the Signal Generator output when required and level control of the Signal Generator output. Both functions are accomplished by means of PIN diodes. Refer to Figure 6-20. In addition an automatic level control circuit maintains the input to the variable attenuator at a constant level, using the same attenuator as is used for modulation. In order to have matched input and output impedances through the attenuator the PIN diodes are connected as variable pi attenuator networks. In the modulator this is modified to satisfy the loading requirements of the oscillator.

4.95 In the attenuators the parallel diodes are all set for a fixed bias. When the series diodes are biased from the control circuits to be fully conducting, the fixed bias on the parallel diodes is set so that they just begin to come on (they are at their high resistance value). As the bias on the series diodes is decreased by the attenuator control (to increase the series resistance) the voltage at the junction of the two sets of diodes changes to cause the parallel diode resistance to decrease. Thus each pi network becomes a very effective attenuator of the RF output. In the modulator attenuator the zero modulation level is set by the modulator DC output so that no clipping will occur on the positive modulation peaks. A maximum modulation of about 80% is possible. Attenuation range for the modulation attenuator, CR1, CR2, and for the variable attenuator CR5-CR9 is 0-20 dB and for the step attenuator CR10-CR13 the steps are 0-20-40 dB. The variable and step attenuators are both set with the front panel SIGNAL GENERATOR LEVEL controls.

4.96 Bias for the modulation attenuator is controlled by R5. The variable attenuator bias is controlled by R11 through emitter follower amplifiers Q1, Q2 which provide current gain. The step attenuator bias is controlled by R19.

4.97 To provide Automatic Level Control (ALC) of the input to the variable attenuator a sample of the signal is taken with a directional coupler and rectified by CR4. To provide temperature stability another diode, CR3, is placed close to CR4 in the same temperature environment and the same DC bias is applied to both of them. CR3 is connected to the non-inverting, and CR4 is connected to the inverting input to the operational amplifier IC3451, the modulator detector amplifier

mounted on the 1000 MHz Low Pass Filter board, 3450. In this way DC variations due to temperature changes are cancelled out.

4.98 The detected RF output from IC3451 is connected to the inverting input of operational amplifier IC3101 mounted on the Attenuator Control Board. Output from this amplifier, through buffer amplifier Q3107 is connected back to the VCA board as the control voltage for CR1 to accomplish the ALC function. The other input to IC3101 is from the modulating source. This causes the output of IC3101 to vary at the modulation frequency. Since this output controls the modulation attenuator CR1, CR2, the RF signal is amplitude modulated. Thus both ALC and Modulation are accomplished with the modulation attenuator. Output from the attenuator passes through J1 to the Microwave Mixer, 3500.

4.99 1300-2200 MHz PHASE LOCK. 3900

4.100 The 1300-2200 MHz Phase Lock circuit, Figure 6-24, is the same as the 1190-1300 MHz Phase Lock. See paragraphs 4.83-4.90 for description. The differences are that no offset control is required. Included on this board are the summing amplifiers, Q10, Q11, Q12 for the Unlocked indication.

4.101 Input reference to Q1 is 100 MHz from the Frequency Multiplier, 2600. The VCO output sample to the sampling gate is 1300-2200 MHz. Control output from Q9 passes through board pin 12 to the 1300-2200 VCO.

4.102 1300-2200 MHz OSCILLATOR. 3800

4.103 The purpose of this oscillator is to furnish frequencies at 100 MHz intervals to the Microwave mixer. This is accomplished by using ten fixed frequency oscillators which are switched on one at a time according to the setting of the 100 MHz dial of the Frequency Selector switches. See Figure 6-23. The circuits of the ten oscillators are the same except for the values of the elements forming the tuned circuits. For the three highest frequencies the transistors used have a higher frequency specification than the others.

4.104 The transistors Q1-Q10 are soldered directly into the transmission lines etched on the circuit board. Parts of the line are expanded to form reactive elements. Oscillator number 1, 2.2 GHZ is typical of the ten and will be used for the description. (Figure 6-23). The 100 MHz Frequency Selector switch connects -12V to the emitter of Q1 through bias adjusting resistors R1, R11, R21. The varicap control voltage from the 1300-2200 MHz Phase Lock circuit is brought in through terminal 2 and through R31, C31, RFC L1 to the proper point on the transmission line.

4.105 C21 is connected to the transmission line one quarter wavelength from the emitter of Q1. This transforms the capacitive reactance to an inductive reactance at the emitter so that the quarter wave line appears as an RFC. The internal input capacitance of the transistor is part of the feedback network. Feedback necessary for oscillation takes place through the internal collector to emitter capacitance. The etched area of the transmission line connected to the collector of Q1 is enlarged in area and forms the inductive part of the tuned circuit. The circuit is tuned by the output capacitance of the transistor. This output capacitance varies with the width of the depletion region at the collector to base junction. Since the depletion region width, and therefore the output capacitance, varies with applied collector voltage this is used to fine tune the oscillator. The control voltage is connected to the collector through L1 and thus provides fine tuning control. Between the point at which L1 is connected is a quarter wavelength. Thus the capacitance of C41 is transformed into an inductance at the point at which it is connected to the collector tuned circuit and in this way forms a coarse tuning adjustment for the oscillator.

4.106 Each oscillator is capacitively coupled to the 50 ohm output transmission line by an etched in capacitance. A directional coupler is also etched on the board to sample the signal on the output line for the phase lock circuit.

4.107 MICROWAVE MIXER. 3500

4.108 Output from the 100 MHz-per-step L.O. is connected to the primary of the mixer T1, CR1, CR2, Figure 6-19. RF from the Voltage Controlled Attenuator is fed to the junction of the mixer diodes CR1, CR2 through the 50 ohm attenuator CR3, CR4, CR5. 0-1000 MHz or 10-1010 MHz is taken out through J2.

4.109 The calibration attenuator is a pi configuration of PIN diodes. Fixed bias is applied to CR3, CR5 so that they have a low resistance when CR4 is biased for high resistance. As current through CR4 is increased the voltage at the junction of CR4, CR5 increases so that CR3, CR5 are biased toward a higher resistance as CR4 is biased for lower resistance. In this way the attenuator is maintained at a 50 ohm impedance over its full attenuation range. Calibration Level control R3120 sets the attenuator to the calibrated level. When the FUNCTION switch is in the MONITOR position the VCA and the mixer attenuator are biased for minimum attenuation.

4.110 1000 MHz LOW PASS FILTER. 3450

4.111 This board, Figure 6-18, includes the modulator detector amplifier, IC1, which was described in paragraphs 4.97, 4.98. This board also has a 1000 MHz low pass filter etched on the board through which the output from the microwave mixer passes. The filter removes the high order frequencies generated in the mixing process.

4.112 RF SWITCH. 3200

4.113 The RF Switch, Figure 6-16, routes the Frequency Synthesizer output to either of the two output connectors or to the plug-in unit. The switches are PIN diodes and only one switch is on at a time. +20V applied to the junction of one of the diode pairs, CR1, CR4 or CR2, CR6 or CR3, CR7 turns on the switch while -12V turns it off. CR5, CR8 are turned on by the -12V to open a low impedance path to ground so that there will be no signal feedthrough when the switch is off.

4.114 With the FUNCTION switch in the SIG GEN position, switch CR1, CR4 is closed when the SIGNAL GENERATOR LEVEL switch is in the MICROVOLTS position. This connects the signal to the 0-1000 MHz output connector. When the LEVEL switch is in the MILLIVOLTS position switch CR2, CR6 is closed and the signal is routed to the Wide Band output amplifier. With the FUNCTION switch in the MONITOR position switch CR3, CR7 is closed and the signal goes to the plug-in as the LO signal.

4.115 WIDE BAND AMPLIFIER. 3300

4.116 Q1, Q2, Q3 are wide band amplifiers capable of producing an output of 1 volt RMS across 50 ohms over a frequency range of 10 kHz-200 MHz. Refer to Figure 6-17. Above 200 MHz there is a rapid rolloff. The amplifier is switched on by applying +20V to board pin 1 and -12V to pin 2. It is on only when the FUNCTION switch is set to SIG GEN and the SIGNAL GENERATOR LEVEL switch is in the MILLIVOLTS position.

4.117 WIDE BAND AMPLIFIER FUSE ASSEMBLY 3050

4.118 Overload protection for the wideband amplifier is provided on this circuit board, Figure 6-14. Fuse, F1, and diodes CR1-CR4 protect the amplifier from excessive voltages which might be applied to the output connector.

4.119 1190-1300 MHz REFERENCE VOLTAGE. 2800

4.120 This circuit, Figure 6-12, supplies the offset voltage required to set the 1190 MHz-1300 MHz Voltage Controlled Oscillator within the proper locking range whenever the 10 MHz or the 1 MHz Frequency Selector dials are changed, as noted in paragraph 4.90. When switching between SIG GEN and MONITOR an additional offset is required from this circuit because of the 10 MHz shift in output frequency. The output offset voltage is supplied by operational amplifier IC1.

4.121 The inverting input IC1-2 is connected to the current summing junction of all the control currents. Current to this junction is supplied through calibrating resistor networks by applying +20V or -12V to a set of resistors or variable control elements in this network. In the network supplying the constant current to this junction R38 is a thermistor temperature compensating element. Current for the change between the SIG GEN and MONITOR mode is supplied through R24 from the FUNCTION switch. Diode, CR1, presents a high resistance to the junction.

4.122 Current control for the digits of the 10 MHz switch is supplied through resistors R13-R22, and R1-R10 which are the calibration adjustments. Current for 1 MHz digits 0-2 enters through board pin 7 to Q2, R27, R28 and for digits 3-5 it enters through Pin 9 to Q1, R25, R26. No additional current is required for digits 6-9. The 1 MHz current control rides on top of the output to the voltage controlled oscillator so that the current due to the 1 MHz dial setting is always a function of the other settings. Output from IC1 is connected through amplifiers Q3, Q4, through isolating diodes CR2, CR3, to Q1 and Q2 which act as variable resistive elements to control the current to the summing junction.

4.123 ATTENUATOR CONTROL. 3100

4.124 While this board is physically located on the left side of the Main Chassis, 2000, the interconnections are shown in the Microwave Casting Interconnection Diagram, 3000, Figure 6-13.

4.125 The Attenuator Control, Figure 6-15, furnishes the required voltages for the proper functioning of the PIN diode attenuators in the Voltage Controlled Attenuator, 3600 (see paragraphs 4.93-4.98) for the operation of the Calibration Attenuator in the Microwave Mixer, 3500 (paragraph 4.109), and to furnish a modulated output to the AM monitor plug-in through board connections P3101-E or 3.

4.126 Output from the Modulation Detector and Detector Reference diode is connected to the inverting input of IC1 and the output through buffer amplifier, Q7, goes to the PIN diode modulator in the Voltage Controlled Attenuator (VCA) to provide automatic leveling of the signal. The modulating signal enters through P3101-5, passes through buffer amplifier, Q2, to the non-inverting input of IC1 and thus modulates the RF signal with the PIN diode modulator. R14 is the calibration adjustment for modulation level and R19 sets the point of zero modulation so that modulation peaks will not be clipped.

4.127 The variable voltage control, R1004, is a variable voltage divider with a range of zero to approaching +20V, the maximum voltage being set by R31. This voltage level is brought in through P3101-A to the inverting input of IC2. The output goes to the inverting input of IC3, the output of which goes through buffer amplifier, Q13, to the PIN diode attenuator in the VCA. Between IC2 and IC3 is the shaping network necessary to give the PIN diode attenuator a linear variable level characteristic. R46 adjusts the DC output of Q8 over a voltage range between +20V and -12V and diode connected Q9 provides high impedance isolation from the shaping circuit. R49, Q11, Q12 operates

in the same way into the resistor shaping network. R29 adjusts a negative voltage to this network. Adjustment of three points on the resistance setting of the variable attenuator control provides very good linearity for this attenuator.

4.128 Control for the PIN diode Step Attenuator enters from the front panel function and level switches at P3101-4 and goes through RF filter L5, C16, C17 to the PIN diode attenuator through P3102A. When the SIGNAL GENERATOR LEVEL switch is in the MICROVOLTS X100 position +20V is connected directly through to the attenuator and level output is set by calibration level control R20. In the X10 position the input to P3101-4 is open (zero volts) and the level setting of the PIN diode attenuator is determined by the adjustment of R43 which is adjusted to set the level 20 dB lower than in the X100 position. In the X1 position -12V is connected to P3101-4. Diode CR1 isolates this voltage from the rest of the circuit but Q4, Q6 are turned on to form a voltage divider between +20V and -12V the level of which is set by R44. This adjustment brings the output 40 dB below the X100 position. In the MILLIVOLTS position of the switch the wide band amplifier is switched in. The voltage applied to pin 4 is zero volts for X100 and +20V for X1000 positions.

4.129 The Signal Generator output is calibrated by adjusting R20 as noted above.

4.130 In the MON position of the Function switch all the PIN diode attenuators in the VCA and the microwave mixer are turned on (minimum RF attenuation). +20V applied to P3101-1 turns on the modulator through Q5, the calibration attenuator through CR2 and the variable attenuator through Q1. +20V to P3101-4 turns on the step attenuator through CR1, and through P3101-6 turns off the modulator buffer amplitier Q2 so that modulation may not be applied.

4.131 10 MHz MODULATOR. 4400

4.132 This circuit, Figure 6-28, furnishes the required 10 MHz for the SIG GEN mode of operation, (paragraph 4.63). In CW or AM the 10 MHz comes from the Reference Divider, 2700, through board pin 14 and then either directly out to the Plug-in through pin 17, or through buffer amplifier, Q5, and out through pin 15 to the 17.9-19 MHz mixer.

4.133 In the FM mode +20V is connected to pin 11 to turn on the Voltage Controlled Oscillator and amplifier, Q3, Q4, the frequency of which is controlled by varicap CR1. The capacitance of the varicap is varied by voltages from three different sources. The modulating signal, either external or internal, is applied through pin 9 to frequency modulate the oscillator. Output from the oscillator through pin 17 to the plug-in and then to the second IF/Discriminator, 4700, generates an AFC voltage which is connected to the varicap through pin 8. A third voltage from the FM CAL control, R1002B, sets or offsets the frequency as required. The adjustment is monitored on the FREQUENCY meter.

4.134 When the MODULATION INTERNAL FREQUENCY switch is set to 1 kHz +20V is connected to pin 5 to turn on the 1 kHz shaper, Q1, Q2. This circuit accepts a 50% duty cycle square wave from the Reference Divider, 2700, and operating as an active filter produces a 1 kHz sine wave suitable for either FM or AM. Output through pin 4 goes to the INTERNAL MODULATION switch, S1004B.

4.135 Variable resistors R3, R4, R5 are the calibration adjustment controls for the FREQUENCY meter when the Function switch is in the MON position. CR2, CR3 are overload protection diodes connected across the FREQUENCY meter.

4.136 SECOND IF/DISCRIMINATOR. 4700

4.137 The Second IF mixer takes the 10 MHz from the Plug-in and the 9.9 MHz from the Reference Divider and mixes them to produce a 100 kHz output. See Figure 6-31. Since the Plug-in output will be 10 MHz ± the frequency error the mixer output will be 100 kHz ± the frequency error. The 9.9 MHz input is amplified by tuned amplifier Q1 and the 10 MHz by tuned amplifier IC1. The outputs go to IC2 which is connected as a mixer. Output passes through a low pass filter to Q5.

4.138 The 100 kHz signal from IC2 is amplified by Q5 and applied to squaring circuit Q6. The output of Q6 is differentiated, R35, C23, and the positive pulses are passed by CR1 to trigger a one-shot multivibrator, Q8, Q10. The one-shot can operate only when the received signal is strong enough to turn on Q4 which then connects the emitters of Q8, Q10 to ground.

4.139 The one-shot output is a pulse width of 5 microseconds (one-half the period of 100 kHz) at the collector of Q10. This pulse width remains the same throughout a frequency error range of from 75 to 125 kHz. The width between pulses, however, depends on the interval between input pulses (pulse frequency) and therefore will be longer for a lower frequency and shorter for a higher frequency. The duty cycle will therefore vary with frequency and will be 50% only when the frequency is 100 kHz. Output at Q8 collector will be the opposite of that at Q10. The outputs from Q8, Q10 collectors are connected to a meter bridge circuit. (See Figure 4-3.)

4.140 The outputs of Q8, Q10 are averaged in the circuits L11, C31 and L12, C35. Refer to Figure 4-3. When the intervals between pulses are longer than the pulses the voltage at the top of C31 rises and that at C35 goes lower and the meter deflects to indicate below center frequency. When the intervals are shorter than the pulse the voltages levels are the opposite and the meter deflects to the

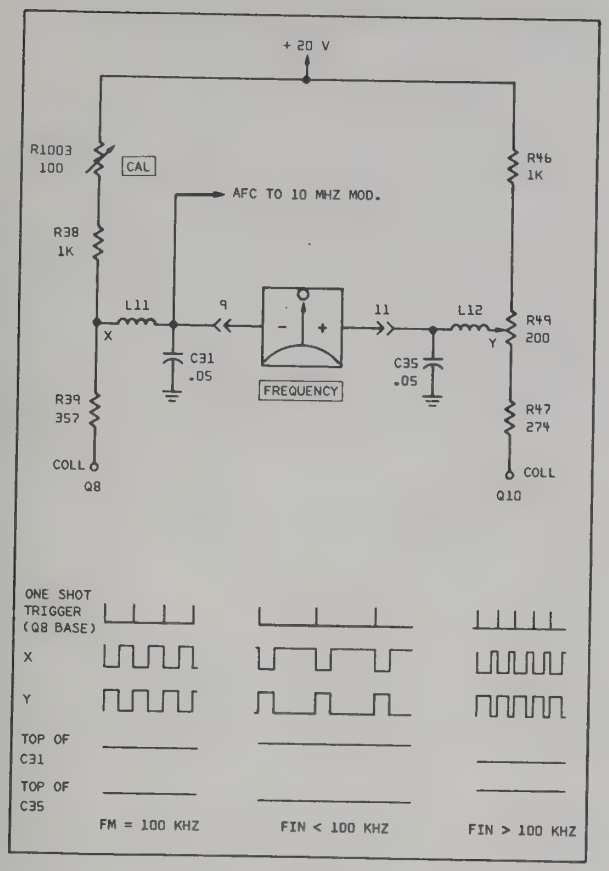

Figure 4-3. Frequency Meter Bridge Circuit

high frequency side. When the pulses and intervals are equal (50% duty cycle) there is no voltage difference between the two capacitors and the meter rests on zero. An FM signal averages out across the meter and does not affect the reading.

4.141 R49 is the calibration adjustment for the meter. R1003 is the front panel CAL control to set the meter to zero when the internal calibration 10 MHz signal is applied to the second IF mixer. The calibration adjustments for the different meter ranges are R4403, R4404, R4405 located on the 10 MHz modulator board.

4.142 The Signal Level Detector is operated by a voltage output from the Plug-in to board pin 15 that is proportional to signal level. When this voltage reaches a level of 1 volt the Schmitt Trigger Q2, Q3 changes state and turns on switch, Q4. This enables the meter one-shot Q8, Q10 by providing a connection to ground for the emitters, and also connects one side of the SIGNAL LEVEL light to ground, turning it on.

4.143 The FM, still present on the signal at the collector of Q10, is fed through the isolation diode CR9 to the base of emitter follower, Q7. The output of Q7 goes through a low pass filter to remove the carrier frequency. The audio output is connected to the oscilloscope plug-in through pin 2. It is also connected to the base of emitter follower, Q9, the output of which goes to the power amplifier on the Amplifier-Generator board, 4800, and then to the speaker.

4.144 An output is taken from the junction of L7, L8 through C27 and board pin 6 to the front panel 100 kHz IF OUTPUT connector. Since the second IF 100 kHz frequency is present at this point, when a counter is connected to the front panel connector the frequency error may be read to the accuracy of the Monitor time base plus the counter accuracy. The counter reading will be 100 kHz ± the error. The error of the received signal or the center frequency of the Monitor in the FM mode may be read in this way.

4.145 AMPLIFIER/GENERATOR. 4800

4.146 The Amplifier/Generator board (Figure 6-32) consists of several different amplifying circuits and in addition contains the 400 Hz generator. 10 kHz from the Reference Divider, 2700, through board pin 21 is applied to two divide by five counters in series, IC1, IC3 to produce a 400 Hz output. This square wave output passes through active low pass filters, IC5, to remove all but the fundamental sine wave frequency. This 400 Hz sine wave is connected through board pin 18 to the INTERNAL FREQUENCY selector switch S1004B.

4.147 The MOD INPUT connector on the front panel is connected to buffer amplifier IC4-6, the output of which goes through board pin 16 to the modulation summing point on the INTERNAL MODULATION switch S1004B-A6. At this point either internal modulation, 1000 Hz, 400 Hz or external modulation and 1000 Hz or 400 Hz are available for either FM or AM depending on the setting of modulation MODE switch, S1004A.

4.148 In the AM mode the MODE switch, S1004A, connects the modulating signal through board pin 11 to the buffer amplifier IC4-2. Output from this amplifier through board pin 15 is connected to the PIN diode modulator in the VCA circuit, 3600.

4.149 A connection from the modulation MODE switch, S1004A-A11, brings either 1000 Hz or 400 Hz and external modulation in through board pin 5 to buffer amplifier, IC2-6, the output of which goes through board pin 14 to the front panel MOD OUT connector.

4.150 The demodulated FM from the Second IF/ Discriminator, 4700, comes in through board pin 7 to buffer amplifier IC2-2. The front panel DE-EMPHASIS switch, S1002A, connects C7 across R12 to form a de-emphasis network if desired.

Output from IC2-1 goes through board pin 13 to the front panel DEMOD OUTPUT connector.

4.151 Demodulated FM from the MONITOR VOLUME control is brought in through board pin 2 to the power amplifier IC6. Output from IC6 is connected to the speaker through board pin 3.

4.152 POWER SUPPLY/REGULATOR. 5100

4.153 The Power Supply/Regulator board, Figure 6-34, is mounted on the rear panel. The rectifier blocks, Z1-Z3 are bolted to the board but are in contact with the rear panel to provide them with a heat sink. The series regulator transistor, Q5001, Q5002, Q5003, are mounted on the rear panel, under the cord bracket, to provide them with a heat sink. Each rectifier output is fused, the fuses being mounted on the 5100 board.

4.154 The regulators are conventional. CR4, CR5, CR6 are the reference diodes, error amplifiers are Q7, IC1, IC2 and regulator drive amplifiers for the series regulators are Q1, Q2, Q3. Resistors R10, R11, R12 are current sampling resistors for overload current control transistors Q4, Q5, Q6. Output voltage adjustment is provided for each supply by the controls R17, R21, R24. The +20V and +5V supplies are tied together in that the +5V reference is taken from the +20V output. Zener diodes CR7, CR8 prevent excessive power supply output on turn-on, or in case of a circuit malfunction.

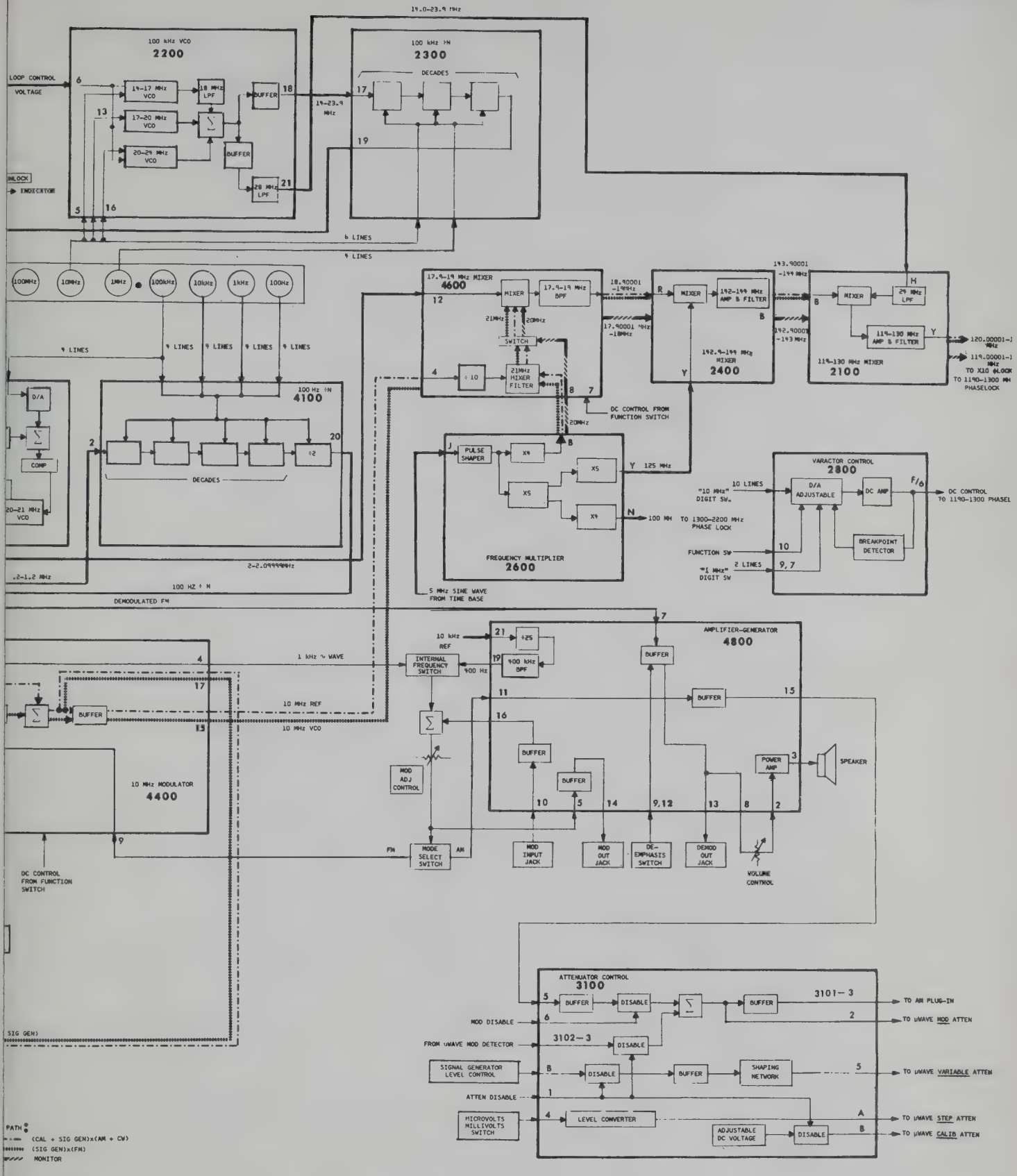

Figure 4-4. Main Frame Block Diagram

Output from IC2-1 goes through board pin 13 to the front panel DEMOD OUTPUT connector.

4.151 Demodulated FM from the MONITOR VOLUME control is brought in through board pin 2 to the power amplifier IC6. Output from IC6 is connected to the speaker through board pin 3.

4.152 POWER SUPPLY/REGULATOR. 5100

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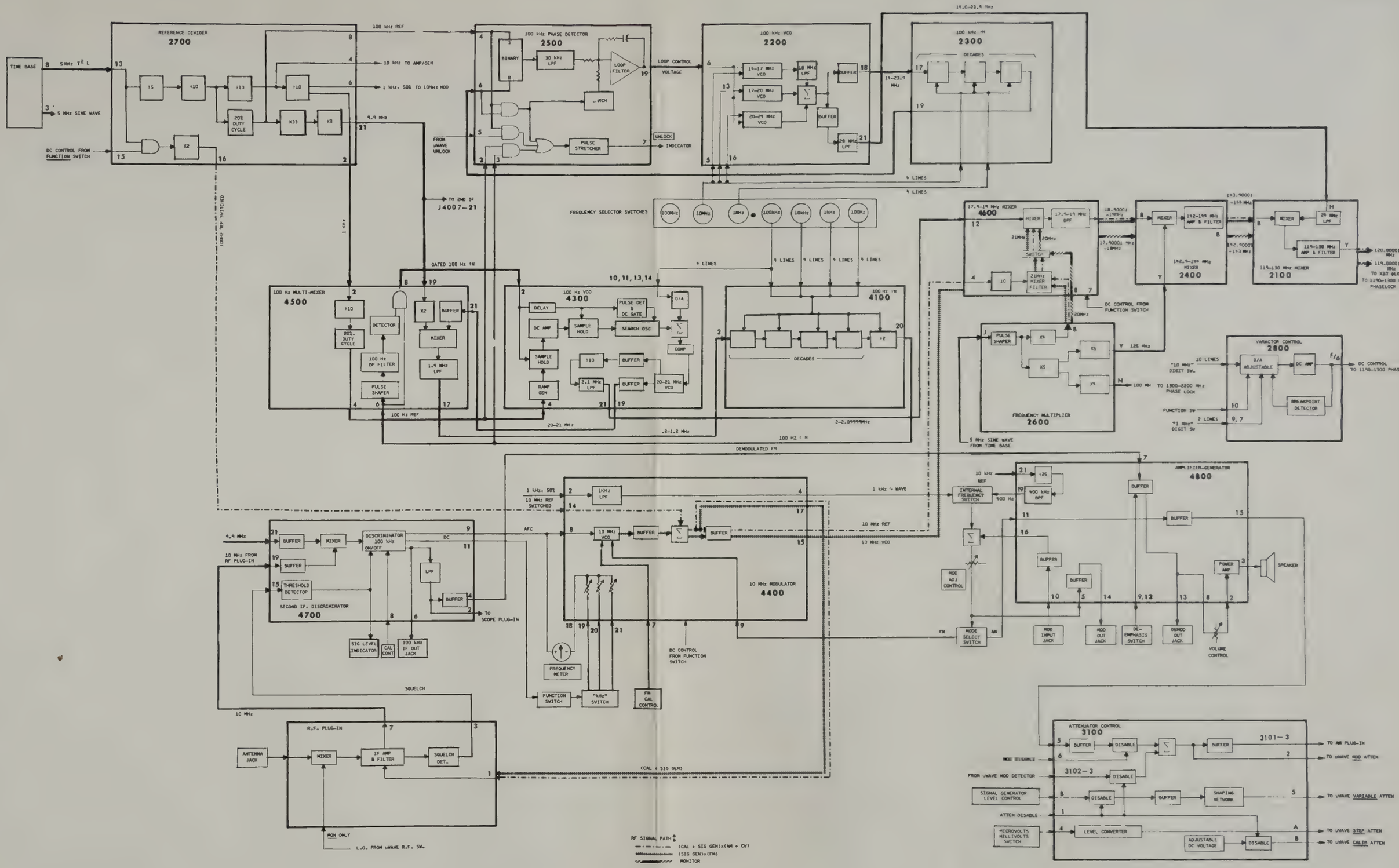


Figure 4-4. Main Frame Block Diagram

4-15/4-16

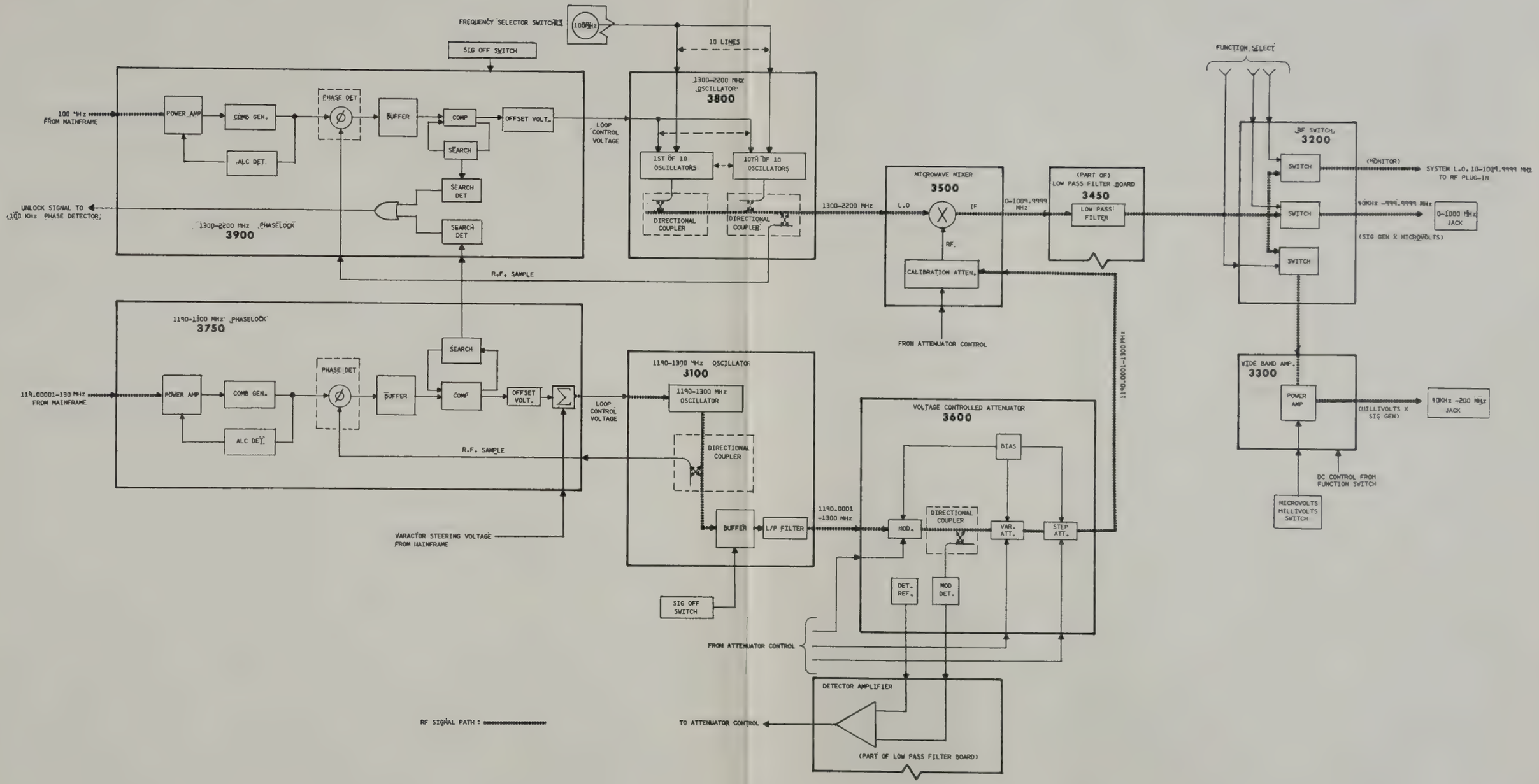


Figure 4-5. Microwave Casting Block Diagram

SECTION 5
MAINTENANCE

GENERAL INFORMATION

5.01 This section of the manual is divided into two parts: "Adjustments", and "Troubleshooting." It is recommended that for adjustments other than those described, the faulty sub-assembly or the entire instrument be returned to Cushman Electronics, Customer Service Department, for calibration and alignment. Refer to paragraph 2.12.

5.02 In the following discussions it is assumed that the technician is familiar with the operating procedures described in Section 3.

5.03 The instrument should be warmed up for a short time before any adjustment is attempted.

5.04 ACCESS AND PARTS LOCATION

5.05 Components in the top part of the instrument can be reached by removing the side covers. Each cover is held in place by six screws. The speaker leads must be disconnected before the right-hand cover can be removed completely. Speaker leads should be secured so that they will not short to the chassis. Stand the instrument on its back to remove the bottom cover. This will expose all the circuit boards that plug into the chassis.

5.06 Figure 5-1 shows the location of the circuit boards in the bottom of the instrument. The same drawing is screened on the inside of the bottom panel. The component identification drawings on the inner leaf of the circuit board schematics show the location of the adjustable components.

5.07 The fuses for the three regulated power supplies are on the rectifier board which is mounted on the inside of the rear panel near the upper left-hand corner. The board is marked with the voltage to identify each fuse. The fuse for the oscilloscope plug-in is mounted above the jack of the left-hand plug-in jack panel. The main fuse is mounted on the rear panel near the power cord and is accessible from the outside of the instrument.

5.08 A board extractor and an extender board are furnished. They are inserted in a compartment in the bottom of the instrument. Before removing or inserting a circuit board, be sure to turn off the power to the instrument.

5.09 All available adjustments in the center casting are accessible through the casting covers and are appropriately marked.

ADJUSTMENTS

5.10 Equipment required:

Digital Multimeter	Dana 4300 or equivalent
X10 Oscilloscope Probe	HP10004B or equivalent
20 dB Fixed Attenuator	Weinschel Model 50-20
40 dB Fixed Attenuator	Weinschel Model 50-40
VHF/UHF Receiver	CE-5 or CE-6 with a 304(B) or 305(B) plug in or equivalent
Signal Generator	HP608C or equivalent
Power Meter	General Microwave 460B and Power Head N422C or equivalent
Electronic Counter	EIP 350C or equivalent
Amplifier	At least +15 dB at 900 MHz

5.11 POWER SUPPLY VOLTAGES

5.12 Remove side covers of the instrument and measure voltages at the marked terminals on the left side of board 5100, which is mounted on the rear panel. Adjustment controls are adjacent to the terminals.

NOTE

The regulated power supplies are set to within 0.5% of the rated output at the factory. They should not be adjusted unless a voltmeter with greater accuracy is available.

a. Measure the +20V with the DMM, at terminal 15 (red wire). Adjust R21 for +20V ± 0.1V.

b. Measure the +5V at terminal 13 (green wire). Adjust R17 for +5V ± 0.03V.

c. Measure the -12V at terminal 14 (orange wire). Adjust R24 for -12V ± 0.06V.

5.13 1.3 - 2.2 GHz PHASE LOCK LOOP

5.14 Remove plug-in. Insert the X10 probe through the hole in the center casting right rear cover plate, marked 6-3900, and connect to the U-shaped wire directly under the hole.

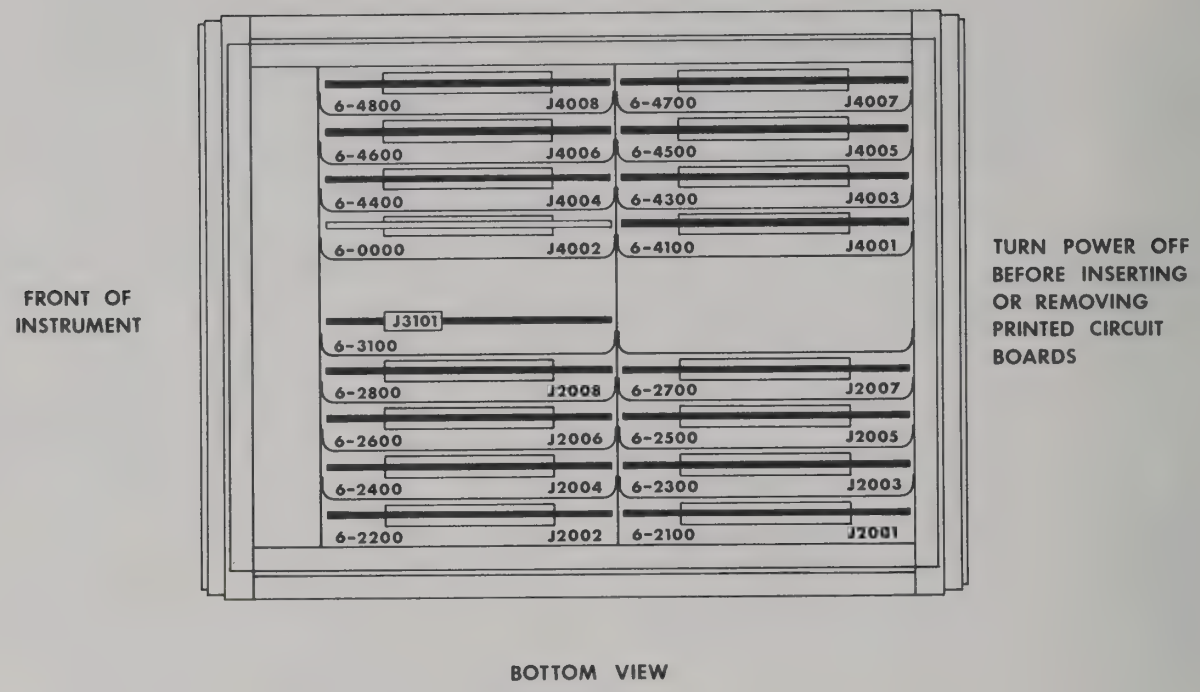


Figure 5-1. Circuit Board Location

a. Set DMM to the 1V DC range and connect probe to input.

b. Step the 100 MHz frequency selector (left dial) through 0-9. Observe voltage at each step.

c. Adjust the appropriate capacitor on the 3800 board for DMM reading of -0.4V DC. Holes on the cover plate over the 6-3800 board are marked 1.3 to 2.2. The proper capacitor is the dial setting plus 1.3. Dial 0 is 1.3, dial 1 is 1.4, etc. (Remove four flat head screws from bottom of plug-in tray and move out of the way to reach rear adjustments.

d. Recheck voltages after making adjustments. Voltage may be between -0.2 and -0.5V, preferable close to -0.4V. Remove probe.

5.15 X10 OSCILLATOR LOOP

5.16 Insert the X10 probe through the hole in the center casting left rear cover plate, marked 6-3750, and connect to the U-shaped wire directly under the hole. Remove plug-in unit to gain access to the hole.

a. Set DMM to 1V DC range and connect probe to input.

b. Set the 1 MHz frequency selector dial (third from left) to zero for this adjustment.

c. Switch the 10 MHz frequency selector dial (second from left) through positions 0-9 and observe voltage at each step.

d. Adjust the appropriate resistor on board 2800. (Remove bottom cover and stand CE-6 on its back.) The adjustable resistors are in order from back to front. Dial 0 is adjusted by resistor toward rear and dial 9 is adjusted by resistor at front.

e. Adjust each dial position for a reading of -0.4V on the DMM. Voltage may be between -0.2 and -0.7V but should be set to -0.4 V as closely as possible. Disconnect probe.

5.17 STEP ATTENUATOR

5.18 Set Monitor frequency to 150 MHz (45 MHz), FUNCTION to SIG GEN; Step Attenuator to X100 microvolts and Variable Attenuator full clockwise.

a. Connect a DC Voltmeter to the AGC output of a VHF/UHF receiver.

b. Connect the 20 dB fixed attenuator between the receiver and the 0-1000 MHz output connector of the CE-6, tune receiver to signal.

c. Note the signal level as indicated by the reading on the DC voltmeter connected to the receiver. Make certain that the receiver is not saturated. (20-50 μV input to receiver.)

d. Switch the CE-6 Step Attenuator to X10 microvolts. Remove the 20 dB fixed attenuator and connect the receiver to CE-6 output. Adjust R43 (marked 20S) on the 3100 board for the same level reading as noted in step c.

e. Reset CE-6 Step Attenuator to X100 microvolts, insert the 40 dB fixed attenuator between the CE-6 output and the receiver. Note the signal level as indicated by the reading on the voltmeter connected to the receiver.

f. Set the CE-6 Step Attenuator X1 microvolts. Remove the 40 dB fixed attenuator and connect receiver to CE-6 output. Adjust R44 (marked 40S) on the 3100 board for the same level reading as noted in step e.

5.19 VARIABLE ATTENUATOR

5.20 Set the CE-6 Monitor as in paragraph 5.18. Set the Variable Attenuator control to 1.0.

a. Connect the voltmeter to test point 6 on the 3100 board. Adjust R31 (marked T) on the 3100 board for a voltage of 16.0V ±0.15 V. Disconnect voltmeter from test point 6.

b. Use the receiver as in 5.18a. Connect the 20 dB fixed attenuator between the receiver and the CE-6 0-1000 MHz output connector. Tune receiver to signal. Note signal level as indicated by the voltmeter connected to the receiver.

c. Reset the Variable Attenuator to 0.1. Remove the 20 dB fixed attenuator and re-connect the receiver to the CE-6 output. Adjust R29 (marked B) on the 3100 board for the same level reading as noted in step b. Remove test equipment.

5.21 OUTPUT POWER CALIBRATION

5.22 Set the CE-6 Monitor Frequency to 150 MHz (45 MHz), FUNCTION switch to SIG GEN; Step Attenuator to X100 microvolts, Variable Attenuator to 1.0.

a. Connect the power meter to the test signal generator and adjust the signal generator output for -27 dBm. (Be certain the test signal generator and the receiver are carefully tuned to the same frequency as the CE-6.)

b. Connect the signal generator to the receiver through the 40 dB fixed attenuator and note level as indicated by DC voltmeter. This is a reference level.

c. Disconnect the signal generator and the fixed 40 dB attenuator from the receiver. Connect the receiver to the 0-1000 MHz output connector on the CE-6. Adjust R20 (marked CA) on the 3100 board for the same level reading as noted in step b.

d. If a 500-1000 MHz signal generator is available, repeat a., b., c., at 900 MHz, making no adjustments. Levels should agree ± 2 dB.

5.23 TIME BASE CALIBRATION

5.24 Set the CE-6 Monitor Frequency to 900.0000 MHz; FUNCTION switch to SIG GEN; Step Attenuator to X100 microvolts; Variable Attenuator to 1.0.

a. Connect 900 MHz Amplifier to the 0-1000 MHz output on the CE-6. Connect the counter to the amplifier output.

b. Set counter for 900 MHz input and observe frequency counted.

c. Remove rubber plug from FINE adjustment hole of crystal oscillator enclosure (mounted on chassis just behind left plug-in tray) and adjust until counter display reads

900,000,000 ± 20 Hz. (Use COARSE adjust if necessary.) Remove counter and amplifier. Replace plug in the crystal oscillator enclosure

5.25 FREQUENCY METER CALIBRATION

5.26 Set the CE-6 Monitor FUNCTION switch to SIG GEN; and CAL control to 12 o'clock position; set meter range switch to 1.5 kHz.

a. Turn off the CE-6 and mechanically adjust the FREQUENCY error meter to center zero. Elevate the 4700 board on extender.

b. Turn on the CE-6 and adjust R49 on the 4700 board (see component identification drawing on Figure 6-31) for a zero reading on the FREQUENCY error meter. Turn off CE-6 and replace 4700 board.

c. Turn on CE-6. Set MODE switch to FM. Set FM CAL control to 2 o'clock position. Adjust L3 on 4400 board (see component identification drawing on Figure 6-28) for a zero reading on the FREQUENCY error meter.

d. Set the CE-6 Frequency to 50.0550 MHz; set FUNCTION switch to MONITOR; set FREQUENCY meter range switch to 1.5 kHz.

e. Set the signal generator (HP8640B) to 50.055 MHz and lock at this frequency. Connect signal generator to the input of any of the Wide Band plug-ins in the Wide Band mode. Set plug-in SENSITIVITY to WIDE. Adjust signal generator output until the CE-6 SIGNAL LEVEL light comes on.

f. Set FREQUENCY meter on the CE-6 to zero with the CAL control.

g. Set the CE-6 Frequency dials to the following frequencies and the FREQUENCY meter range switch to the following settings: Adjust the indicated control on board 4400 for a full scale reading, either plus or minus, for each range. (The signal generator, HP8640B, must be left at the locked frequency, 50.055 MHz.) The first setting gives the minus full scale reading and the second the plus full scale reading.

CE-6 Frequency	Meter Range Switch	Adjustment Control
50.0565	1.5 kHz	R4403, marked 1.5 kHz, adjust for (-) full scale
50.0535	1.5 kHz	Check for (+) full scale
50.0600	5.0 kHz	R4404, marked 5 kHz, adjust for (-) full scale
50.0500	5.0 kHz	Check for (+) full scale
50.0700	15 kHz	R4405, marked 15 kHz adjust for (-) full scale
50.0400	15 kHz	Check for (+) full scale

TROUBLESHOOTING

5.27 Before making extensive checks of other circuits the power supply regulated outputs should be checked according to paragraph 5.12.

5.28 Check the instrument in both Monitor and Signal Generator modes to determine whether the trouble is confined to either mode. Also check to see whether it is localized in either CW, AM or FM. If another CE-6 is available, suspected boards may be substituted. In shooting trouble, use the block diagrams, Figures 4-4, 4-5 to trace signals through the instrument.

5.29 In all modes of operation the phaselock loops of the frequency synthesizers are a most important part of the instrument. When any loop is not phase locked the proper frequencies are not synthesized. The UNLOCKED light comes on if any of these circuits are out of lock.

5.30 To determine the area in which a circuit is not locking:

a. Turn off the CE-6 and raise the 2500 board on the extender (Figure 6-9.) Turn on the CE-6 and observe test point 4 with an oscilloscope or a VOM. A voltage 0.6V or less indicates that the 100 kHz Reference signal and the 100 kHz ÷N circuits are operating normally. A pulsating signal going above 0.6V or a steady level higher than 0.6V indicates trouble in one of these circuits.

b. If test point voltage shows a low, check at board pin 5. At this point a low (0.6V or less) indicates the microwave phase lock loops are operating normally.

c. An unlocked condition with both test point 4 and board pin 5 showing low indicates an unlocked condition in the 100 Hz phase lock loop.

5.31 To further narrow down the area of trouble, suspected boards may be substituted if another CE-6 is available. A high frequency oscilloscope such as the HP180 series or equivalent, or a frequency counter such as the EIP 350C or equivalent may be used for signal tracing. The frequencies and voltages into and out of the circuit boards are given in many cases on the schematic diagram.

5.32 In the troubleshooting Table 5-1 some front panel indications of possible troubles are listed with the possible cause and the circuits or boards that should be checked.

5.33 If trouble is traced to the Microwave Casting it is suggested that the instrument be returned to Cushman Electronics, Customer Service, for repair. See paragraph 2.12.

TABLE 5-1. TROUBLESHOOTING CHART

TROUBLE	POSSIBLE CAUSE	CHECK
1. CE-6 Inoperative	Main Fuse	Check and replace if necessary
2. CE-6 Inoperative except oven light	Fuse on Power Supply Regulator Board	Check and replace if necessary
3. Frequency Meter Pinned, Signal Level light on	No -12V DC	Check -12V fuse on rectifier board
4. No RF Signal Reception, Signal Generation OK	RF Plug-In	Check for signal through plug-in, check for proper squelch output
5. No Signal Generation, Reception OK, CAL OK	40 dB attenuator fuse	Check 40 dB attenuator
6. No Signal Generation FM or CW, No CAL, reception OK	10 MHz Modulator	Check 10 MHz outputs from 10 MHz board, 4400
7. No CW Signal Generation FM Sig Gen OK	No 10 MHz output from Reference Divider	Check for 10 MHz output from Reference Divider board, 2700
8. No FM Sig Gen, CW Sig Gen OK	VCO on 10 Hz Modulator board	Check VCO output at input to Q4404
9. No CAL, No SIG GEN, No Reception, Unlocked Light On	Reference Divider Board or Time Base	Check board 2700 for proper outputs and input
10. Frequency meter pinned in CAL or Sig Gen. SIGNAL LEVEL light on	Second IF and Discriminator	Check 9.9 MHz to board 4700, check Discriminator input and output
11. SIGNAL LEVEL light on. No RF in. Frequency Meter pinned in MONITOR	RF Plug-In	Squelch misadjusted
12. Unlocked light on, but CE-6 appears to work OK	Unlocked light logic or pulse stretcher	Check Unlocked light circuits on 2500 board
13. Unlocked light on in some Frequency Selector positions	Any one of the phase locked loops	Use procedures of para. 5.29-5.31 to determine which one

SECTION 6
PARTS LISTS AND SCHEMATIC DIAGRAMS

INTRODUCTION

6.01 The following parts lists and schematic diagrams have been arranged in order according to the Circuit Reference Series numbers. Refer to paragraphs 4.02-4.06. Each schematic diagram and parts list is identified with this number. The circuit boards in the instrument are stamped with an identifying Circuit Board number. See Cross Reference Table 6-1 below.

6.02 Parts list pages are grouped with the schematic diagrams to which they refer. Component identification drawings showing the location of the individual components on the circuit boards are placed on the inner sheet of the schematic diagram to which they apply.

Table 6-1. Printed Circuit Board and Circuit Reference Numbers Cross Reference

Ckt. Bd. No.	Circuit Title	Ckt. Ref. No.	Assembly No.	Figure No.
1780-0257	100 Hz Multiplier/Mixer	4500	7001-0164	6-29
1780-0261	142.9 MHz-144 MHz Mixer	2400	7001-0145	6-8
1780-0262	119 MHz-130 MHz Mixer	2100	7001-0142	6-5
1780-0264	17.9 MHz-19 MHz Mixer	4600	7001-0165	6-30
1780-0269	Attenuator Control	3100	7001-0151	6-15
1780-0271	1190 MHz-1300 MHz Phase Lock	3750	7001-0158	6-22
1780-0272	Amplifier/Generator	4800	7001-0167	6-32
1780-0273	Wide Band Amplifier	3300	7001-0153	6-17
1780-0274	1300 MHz-2200 MHz Phase Lock	3900	7001-0160	6-24
1780-0275	Voltage Controlled Attenuator	3600	7001-0156	6-20
1780-0278	1300 MHz-2200 MHz Oscillator	3800	7001-0159	6-23
1780-0281	R.F. Switch	3200	7001-0152	6-16
1780-0283	Microwave Mixer	3500	7001-0155	6-19
1780-0284	Lamp Mounting	1100	---------	6-3
1780-0285	Extension Board	----	---------	----
1780-0287	100 Hz Divide-by-N	4100	7001-0161	6-26
1780-0288	Power Supply/Regulator	5100	---------	6-34
1780-0290	100 kHz Voltage Controlled Oscillator	2200	7001-0143	6-6
1780-0294	100 Hz Voltage Controlled Oscillator	4300	7001-0162	6-27
1780-0297	Frequency Multiplier	2600	7001-0147	6-10
1780-0298	100 kHz Phase Detector	2500	7001-0146	6-9
1780-0299	100 kHz Divide-by-N	2300	7001-0144	6-7
1780-0302	Reference Divider	2700	7001-0148	6-11
1780-0310	10 MHz Modulator	4400	7001-0163	6-28
1780-0311	Second IF/Discriminator	4700	7001-0166	6-31
1780-0312	1000 MHz Low Pass Filter	3450	7001-0154	6-18
1780-0313	1190 MHz-1300 MHz Reference Voltage	2800	7001-0149	6-12
1780-0314	1190 MHz-1300 MHz Oscillator	3700	7001-0157	6-21
1780-0316	A.C. Filter	5200	---------	6-35

FRONT PANEL. 1000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
1000	Front Panel Assy.	7003-0051	Cushman	
	Frequency Selector Switch Assy.	7011-0016	Cushman	
	CAPACITORS			
C1	Cer, 0.1μF, ±20%, 25V	1005-0044	Sprague	5C023104X0250B3
	CONNECTORS			
J1	Conn, BNC Type	2536-0010	Kings	KC79-35
J2	Conn, BNC Type	2536-0010	Kings	KC79-35
J3	Conn, BNC Type	2536-0010	Kings	KC79-35
J4	Conn, BNC Type	2536-0010	Kings	KC79-35
J5	Conn, Bulkhead Feed Thru	2536-0038	Kings	KC99-54
J6	Conn, Bulkhead Feed Thru	2536-0038	Kings	KC99-54
	INDICATORS			
DS1	Lamp, Oven on	2900-0007	Dialco	507-4537-1437-640
DS2	Diode, Light Emitting	1281-0041	Litronix	MV10B
DS3	Diode, Light Emitting	1281-0041	Litronix	MV10B
	METER			
M1	Meter, Frequency	1402-0018	Cushman	
	RESISTORS			
R1	P/O S2A & B			
R2A/B	Pot, 1k 500k, Dual Concentric	1204-0003	Allen-Bradley	JJC91400C
R3	P/O S7			
R4/S12	Pot, 2.5k, ±20%, 1/2W, w/switch	1203-0053	CTS	GC321
R5	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R6	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
	SWITCHES			
S1	Switch, rotary, 2 pole 10 pos	1851-0074	Cushman	
S2A&B/R1	Switch, Concentric shaft w/pot	1851-0072	Cushman	
S3	Switch, rotary, 7 pole 10 pos	1851-0070	Cushman	
S4	Switch, rotary, 5 pole 3 pos	1851-0071	Cushman	
S5	Switch, rotary, 5 pole 10 pos	1851-0075	Cushman	
S6	Switch, Lever, 2 pole 3 pos.	1851-0063	Cushman	
S7/R3	Switch, Concentric shaft w/pot	1851-0068	Cushman	
S8	Switch, rotary, 4 pole 10 pos	1851-0073	Cushman	
S9	Switch, rotary, 4 pole 10 pos	1851-0073	Cushman	
S10	Switch, rotary, 5 pole 5 pos	1851-0069	Cushman	
S11	Switch, rotary, 4 pole 10 pos	1851-0073	Cushman	
S12	P/O R4			
S13	Switch, rotary, 4 pole 10 pos	1851-0073	Cushman	

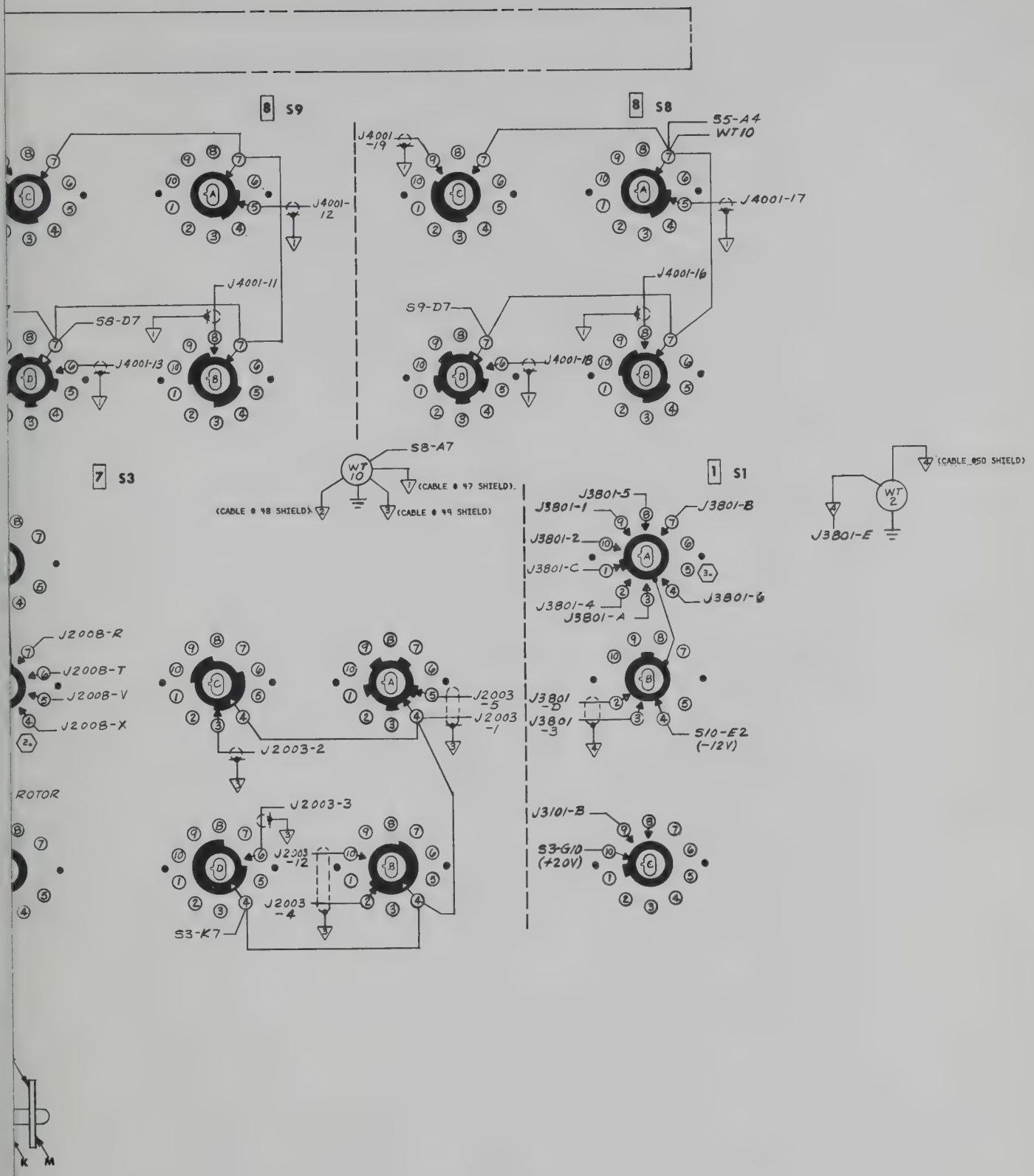
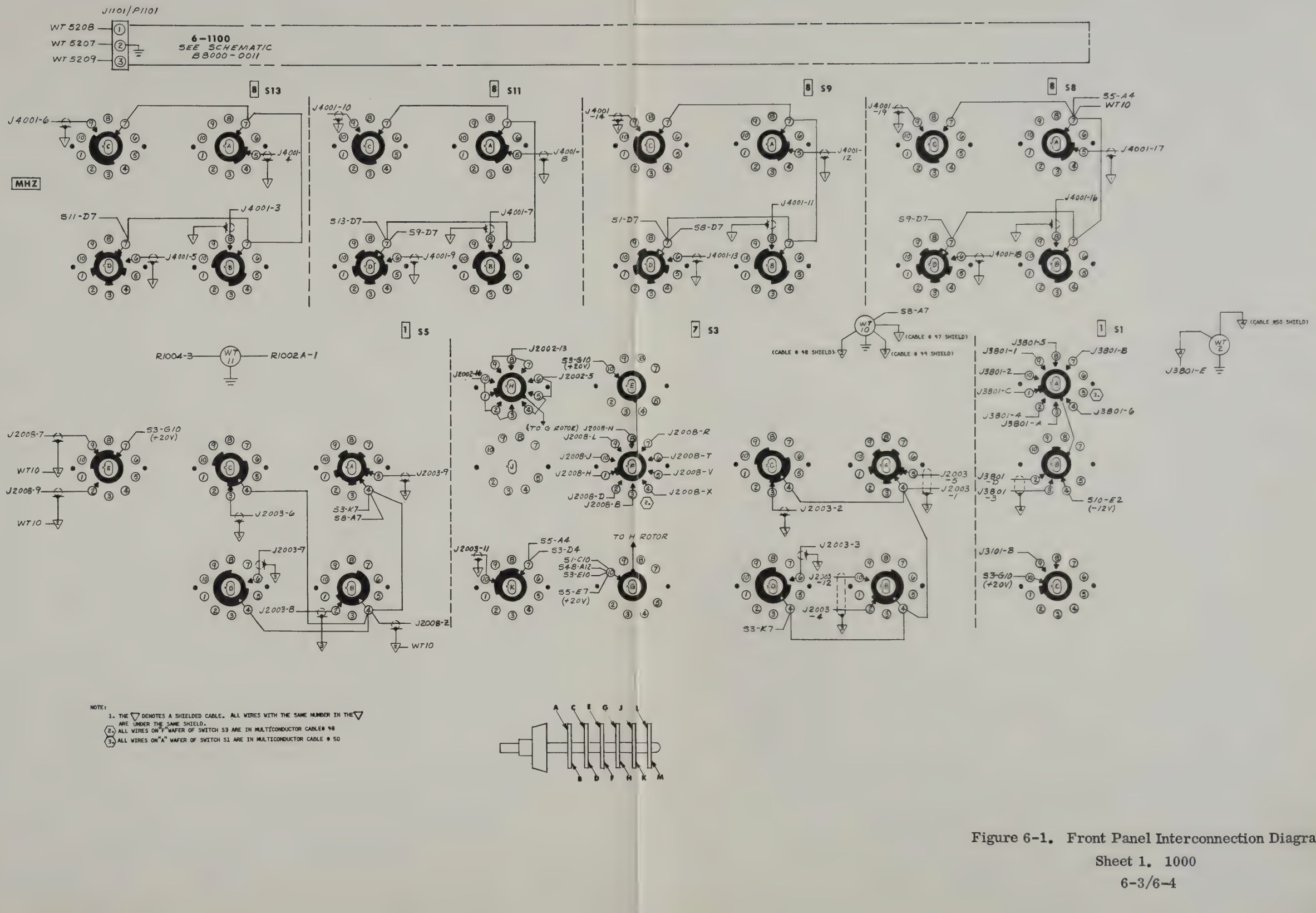


Figure 6-1. Front Panel Interconnection Diagram, Sheet 1. 1000

6-3/6-4

FRONT PANEL. 1000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
1000	Front Panel Assy.	7003-0051	Cushman	
	Frequency Selector Switch Assy.	7011-0016	Cushman	
	CAPACITORS			
C1	Cer, 0.1μF, ±20%, 25V	1005-0044	Sprague	5C023104X0250B3
	CONNECTORS			
J1	Conn, BNC Type	2536-0010	Kings	KC79-35
J2	Conn, BNC Type	2536-0010	Kings	KC79-35
J3	Conn, BNC Type	2536-0010	Kings	KC79-35
J4	Conn, BNC Type	2536-0010	Kings	KC79-35
J5	Conn, Bulkhead Feed Thru	2536-0038	Kings	KC99-54
J6	Conn, Bulkhead Feed Thru	2536-0038	Kings	KC99-54
	INDICATORS			
DS1	Lamp, Oven on	2900-0007	Dialco	507-4537-1437-640
DS2	Diode, Light Emitting	1281-0041	Litronix	MV10B
DS3	Diode, Light Emitting	1281-0041	Litronix	MV10B
	METER			
M1	Meter, Frequency	1402-0018	Cushman	
	RESISTORS			
R1	P/0 S2A & B			
R2A/B	Pot, 1k 500k, Dual Concentric	1204-0003	Allen-Bradley	JJC91400C
R3	P/0 S7			
R4/S12	Pot, 2.5k, ±20%, 1/2W, w/switch	1203-0053	CTS	GC321
R5	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R6	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
	SWITCHES			
S1	Switch, rotary, 2 pole 10 pos	1851-0074	Cushman	
S2A&B/R1	Switch, Concentric shaft w/pot	1851-0072	Cushman	
S3	Switch, rotary, 7 pole 10 pos	1851-0070	Cushman	
S4	Switch, rotary, 5 pole 3 pos	1851-0071	Cushman	
S5	Switch, rotary, 5 pole 10 pos	1851-0075	Cushman	
S6	Switch, Lever, 2 pole 3 pos.	1851-0063	Cushman	
S7/R3	Switch, Concentric shaft w/pot	1851-0068	Cushman	
S8	Switch, rotary, 4 pole 10 pos	1851-0073	Cushman	
S9	Switch, rotary, 4 pole 10 pos	1851-0073	Cushman	
S10	Switch, rotary, 5 pole 5 pos	1851-0069	Cushman	
S11	Switch, rotary, 4 pole 10 pos	1851-0073	Cushman	
S12	P/0 R4			
S13	Switch, rotary, 4 pole 10 pos	1851-0073	Cushman	



NOTE:

1. THE ▽ DENOTES A SHIELDED CABLE. ALL WIRES WITH THE SAME NUMBER IN THE ▽ ARE UNDER THE SAME SHIELD.
2. ALL WIRES ON "F" WAFER OF SWITCH S3 ARE IN MULTICONDUCTOR CABLE @ 98
3. ALL WIRES ON "A" WAFER OF SWITCH S1 ARE IN MULTICONDUCTOR CABLE @ 50

Figure 6-1. Front Panel Interconnection Diagram, Sheet 1. 1000

6-3/6-4

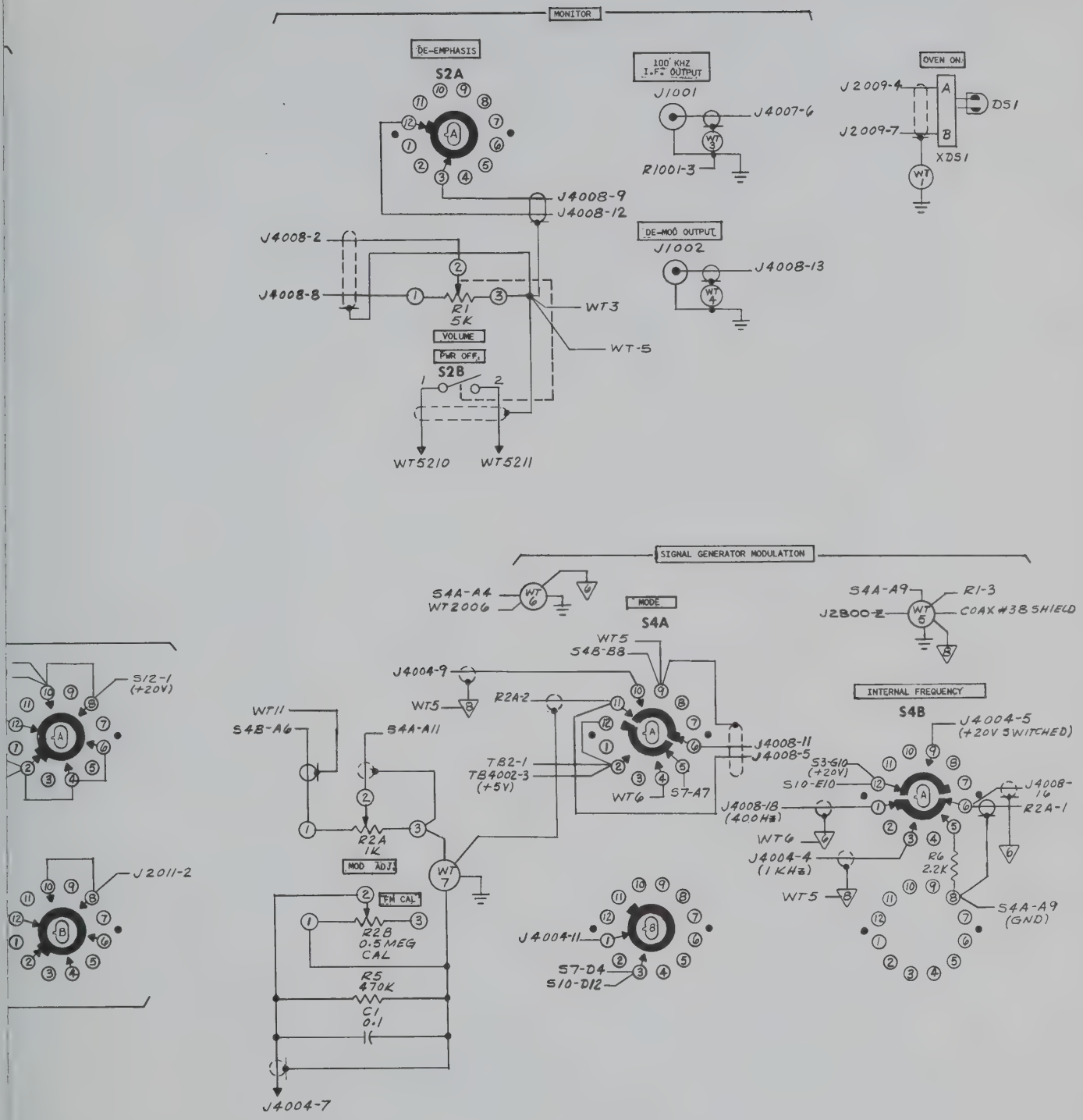
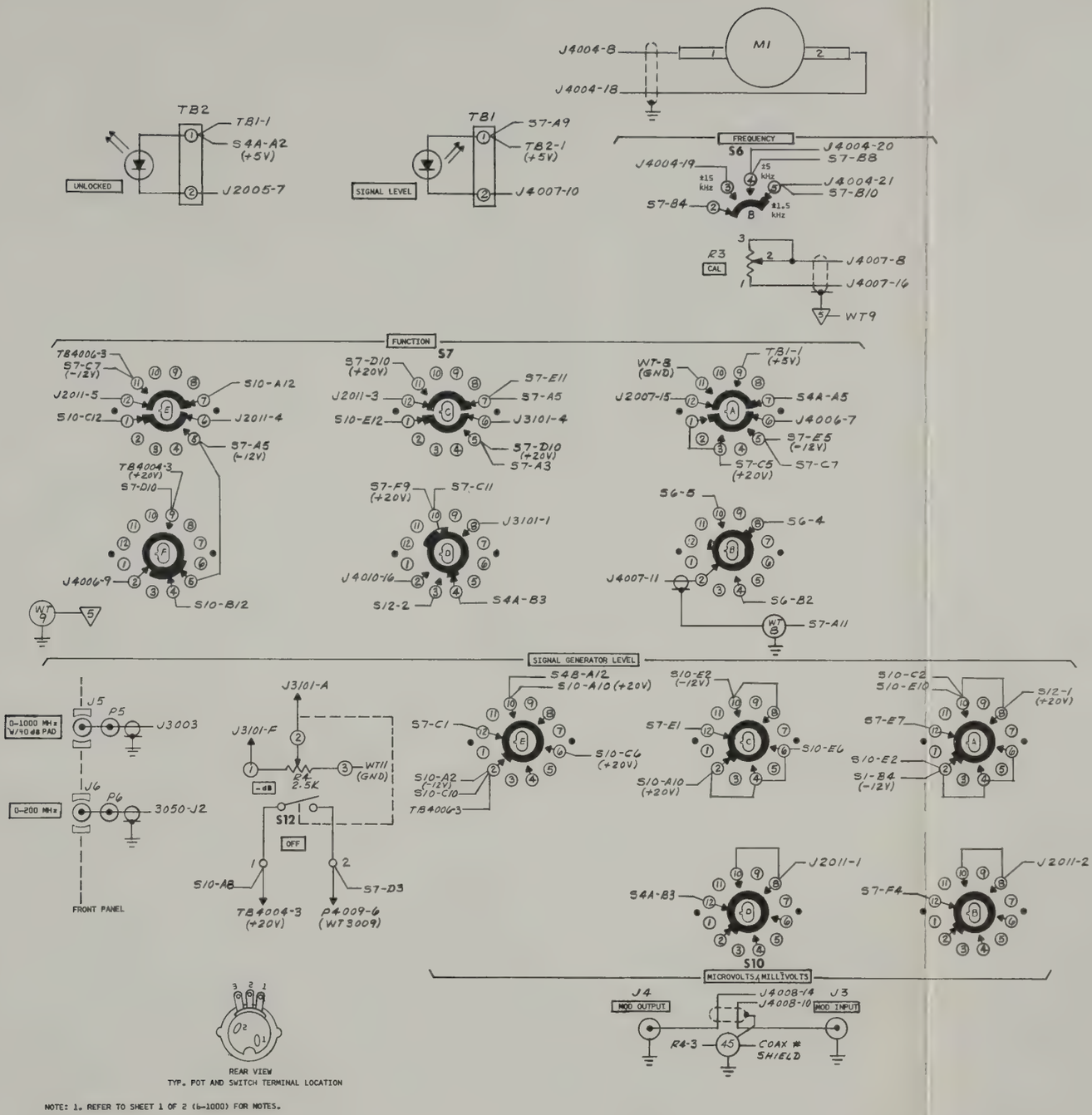


Figure 6-2. Front Panel Interconnection Diagram, Sheet 2. 1000



NOTE: 1. REFER TO SHEET 1 OF 2 (b-1000) FOR NOTES.

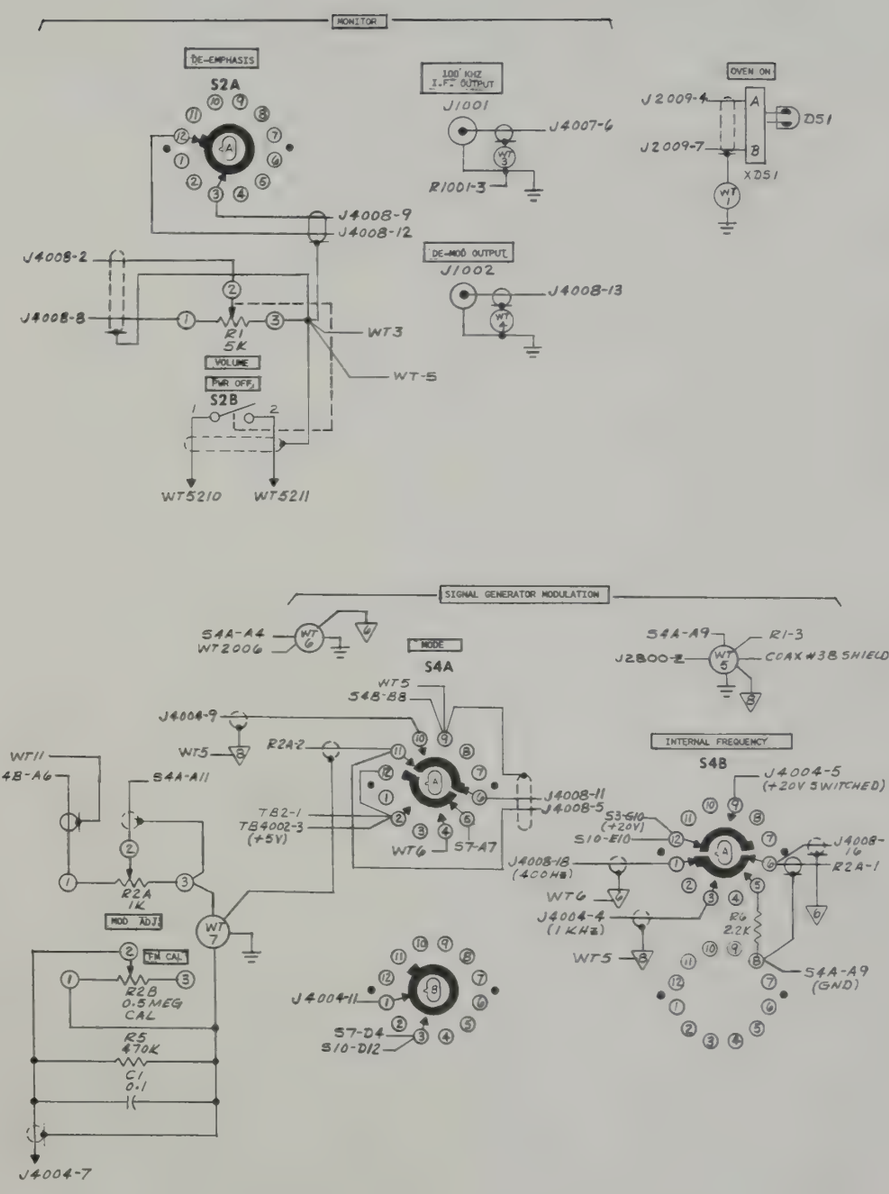


Figure 6-2. Front Panel Interconnection Diagram, Sheet 2. 1000

6-5/6-6

LAMP MOUNTING. 1100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
1100	Lamp Mounting P.C. Board Assy.	7001-0141	Cushman	
	P.C. Board	1780-0284	Cushman	
	CONNECTOR			
P1	Conn, 3 pin Receptacle, Miniature	2535-0044	Molex	2391-3A
	LAMPS			
DS1	T - 1 - 3/4 midget flange base	2870-0016	Chi. Miniature	381
DS2	T - 1 - 3/4 midget flange base	2870-0016	Chi. Miniature	381
DS3	T - 1 - 3/4 midget flange base	2870-0016	Chi. Miniature	381
DS4	T - 1 - 3/4 midget flange base	2870-0016	Chi. Miniature	381
DS5	T - 1 - 3/4 midget flange base	2870-0016	Chi. Miniature	381
DS6	T - 1 - 3/4 midget flange base	2870-0016	Chi. Miniature	381
DS7	T - 1 - 3/4 midget flange base	2870-0016	Chi. Miniature	381

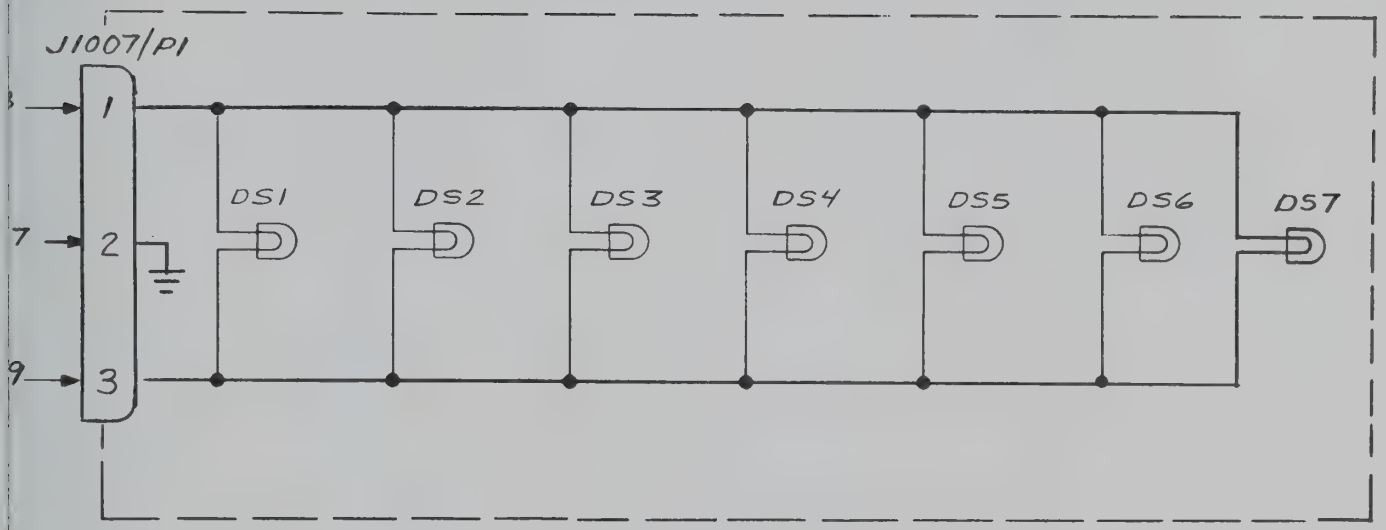


Figure 6-3. Lamp Mounting. 1100

6-9/6-10

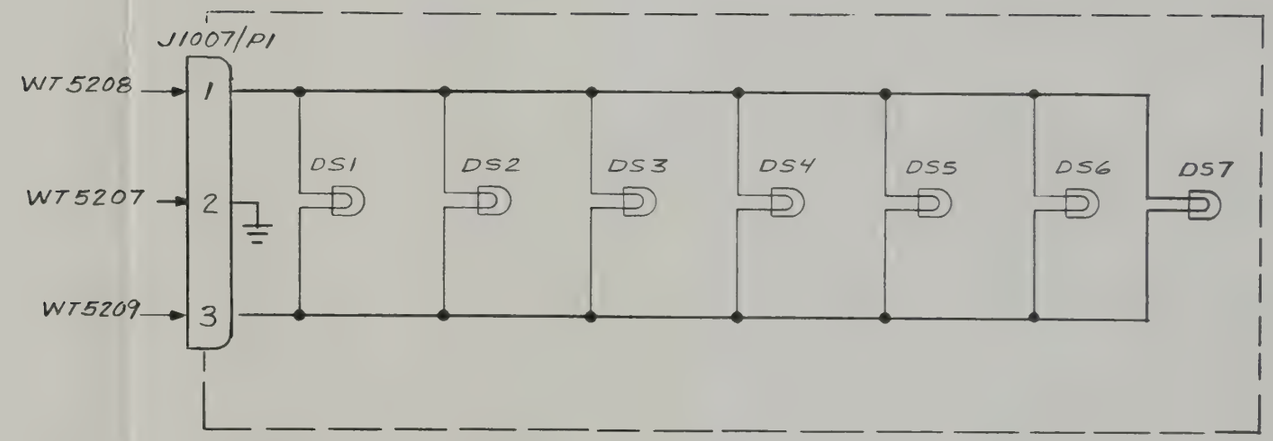


Figure 6-3. Lamp Mounting. 1100

6-9/6-10

MAIN CHASSIS. 2000, 4000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	MAIN ASSEMBLY	7017-0015	Cushman	
	CABLE ASSEMBLY			
	SMC Rt. Angle Plug to BNC Push-on	7032-0009-01	Cushman	
	Rt. Angle BNC Plug to Rt. Angle Plug	7032-0021		
P1/01	Conn, 3 pin, plug min.	2535-0045	Molex	2139-3
XDS1001	Conn, 2 pin	2900-0004	Dialco	515-0050
	CONNECTORS			
J2001	22 Contact, 44 terminal	2535-0023	Viking	2VK22D/1-1
J2002	22 pin	2535-0018	Viking	2VK22S/1-1
J2003	22 pin	2535-0018	Viking	2VK22S/1-1
J2004	22 Contact, 44 terminal	2535-0023	Viking	2VK22D/1-1
J2005	22 pin	2535-0018	Viking	2VK22S/1-1
J2006	22 Contact, 44 terminal	2535-0023	Viking	2VK22D/1-1
J2007	22 pin	2535-0018	Viking	2VK22S/1-1
J2008	22 Contact, 44 terminal	2535-0023	Viking	2VK22D/1-1
J2009	Socket, Octal	2605-0001	Cinch Jones	8EM
J2010	24 pin female	2535-0020	Amphenol	25-190-24
J2011	6 Contact min.	2535-0049	Molex	R03-06-1061
J3101	Conn, 12 pin, female	2535-0052	Masterite	2MC6D/1-1
J3801	P/O 3800			
J3802	Not Used			
J3803	12 pin, female	2535-0052	Masterite	2MC6D/1-1
J4001	22 pin	2535-0018	Viking	2VK22S/1-1
J4002	Not Used			
J4003	22 pin	2535-0018	Viking	2VK22S/1-1
J4004	22 pin	2535-0018	Viking	2VK22S/1-1
J4005	22 pin	2535-0018	Viking	2VK22S/1-1
J4006	22 pin	2535-0018	Viking	2VK22S/1-1
J4007	22 pin	2535-0018	Viking	2VK22S/1-1
J4008	22 pin	2535-0018	Viking	2VK22S/1-1
J4009	6 Contact min.	2535-0049	Molex	R03-06-1061
J4010	24 Pin female	2535-0020	Amphenol	25-190-24
	Extender PC Board Assy	7001-0140	Cushman	
	PC Board	1780-0285	Cushman	
	CONNECTOR			
	22 Contact, 44 terminal	2535-0023	Viking	2VK22D/1-1

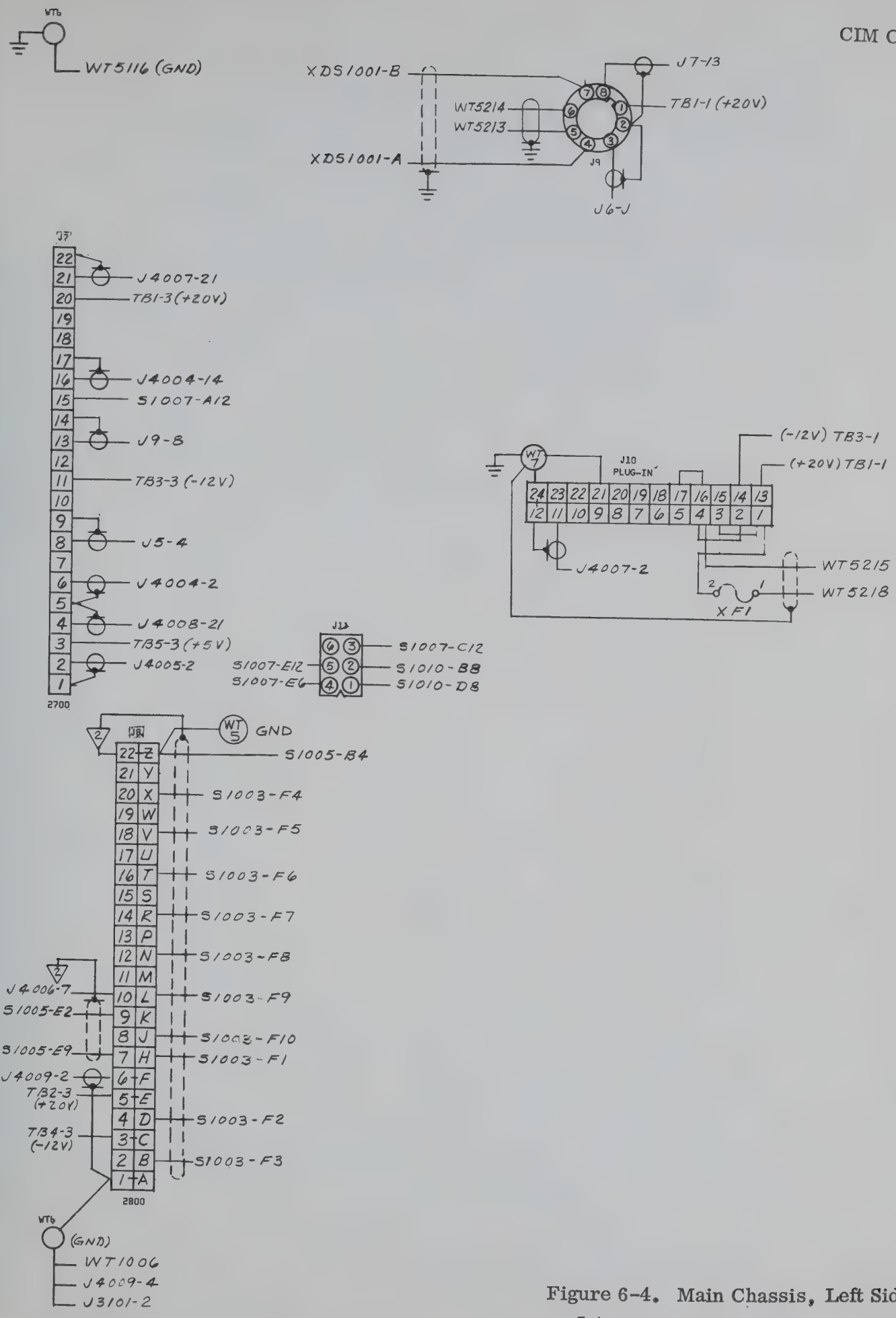


Figure 6-4. Main Chassis, Left Side, Interconnection Diagram. 2000

6-13/6-14

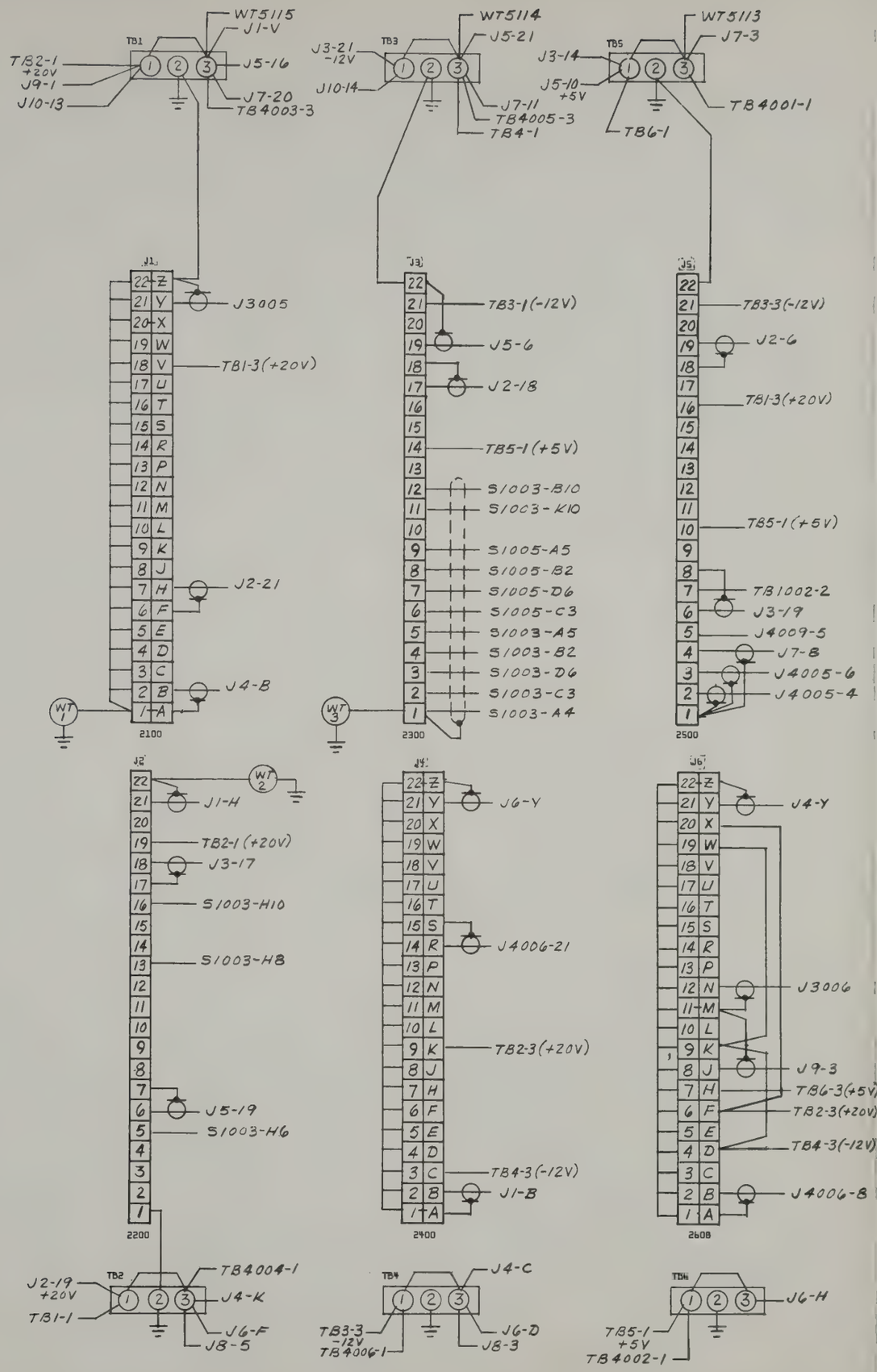


Figure 6-4. Main Chassis, Left Side, Interconnection Diagram. 2000

6-13/6-14

119 MHz - 130 MHz MIXER. 2100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2100	119 MHz-130 MHz P.C. Board Assy.	7001-0142	Cushman	
	P.C. Board	1780-0262	Cushman	
	CAPACITOR			
C1	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C2	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C3	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C4	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C5	Cer, Trim, 2-8pF, 350V NPO Vert.	1001-0004	Erie	538-002A-2-8-89A
C6	Cer Tub, 1.5pF, ±.25pF, 500V	1005-0041	Erie	301-000-C0K0-159C
C7	Cer Tub, 12pF, ±5%, 500V	1005-0076	Erie	301-000-0C0G0-120J
C8	Cer Tub, 1.5pF, ±.25pF, 500V	1005-0041	Erie	301-000-C0K0-159C
C9	Cer Tub, 15pF, ±5%, 500V	1005-0010	Erie	301-000-C0G0-150J
C10	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C11	Cer, Trim, 2-8pF, 350V NPO Vert.	1001-0004	Erie	538-002A-2-8-89A
C12	Cer Tub, 15pF, ±5%, 500V	1005-0010	Erie	301-000-C0G0-150J
C13	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C14	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C15	Cer Trim, 9-35pF, 350V	1001-0006	Erie	538-002-94D
C16	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C17	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C18	Cer Trim, 5.5-18pF	1001-0008	Erie	538-002A-5.5-18
C19	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
	COILS			
L1	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L2	Choke, .33μH, ±20%, molded	1585-0007	Delevan	1840-04
L3	Var, 3 1/4 turn	1596-0052	Cushman	
L4	Var, 3 1/4 turn	1596-0052	Cushman	
L5	Var, 3 1/4 turn	1596-0052	Cushman	
L6	Choke, .15μH, ±20%, molded	1585-0048	Delevan	1537-00
L7	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L8	Var, 4 3/4 turn	1596-0062	Cushman	
	DIODES			
CR1	Diode, HPA-2800	1283-0001	HPA	5082-2800
CR2	Diode, HPA-2800	1283-0001	HPA	5082-2800
CR3	Diode, HPA-2800	1283-0001	HPA	5082-2800
CR4	Diode, HPA-2800	1283-0001	HPA	5082-2800
	RESISTORS			
R1	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R2	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R3	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R6	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R7	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R8	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R9	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105

119 MHz - 130 MHz MIXER (cont). 2100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSFORMER			
T1	Bifilar, Toroidal	1579-0025	Cushman	
T2	Toroid, Trifilar	1579-0017	Cushman	
T3	Toroid, Trifilar	1579-0017	Cushman	
T4	Bifilar, Toroidal	1579-0025	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q2	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563

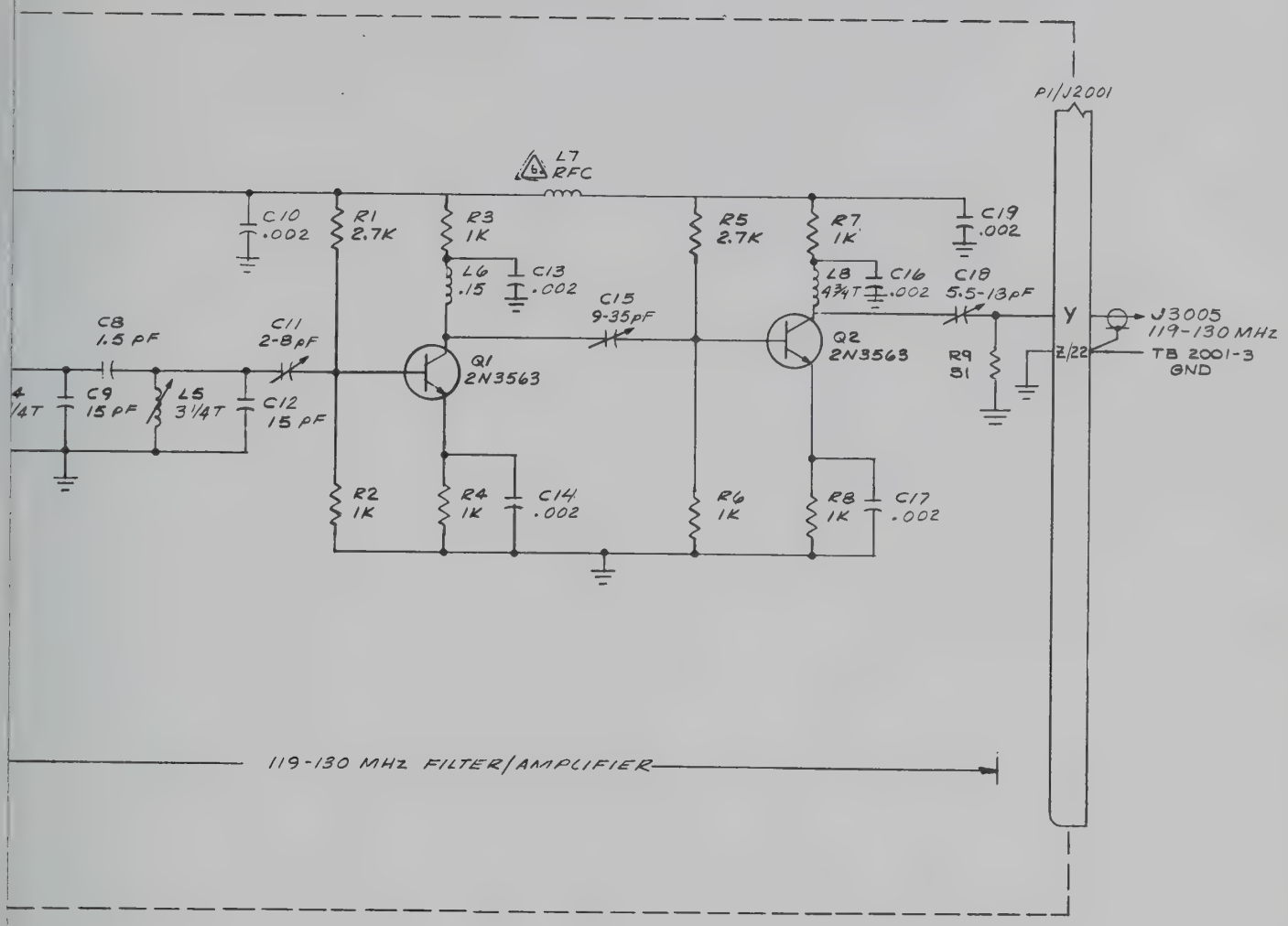
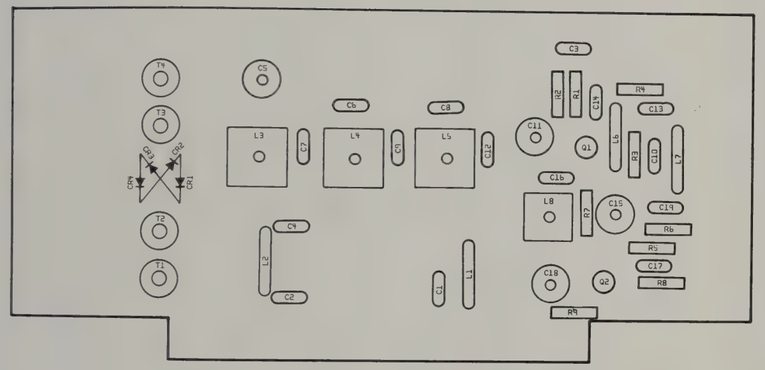


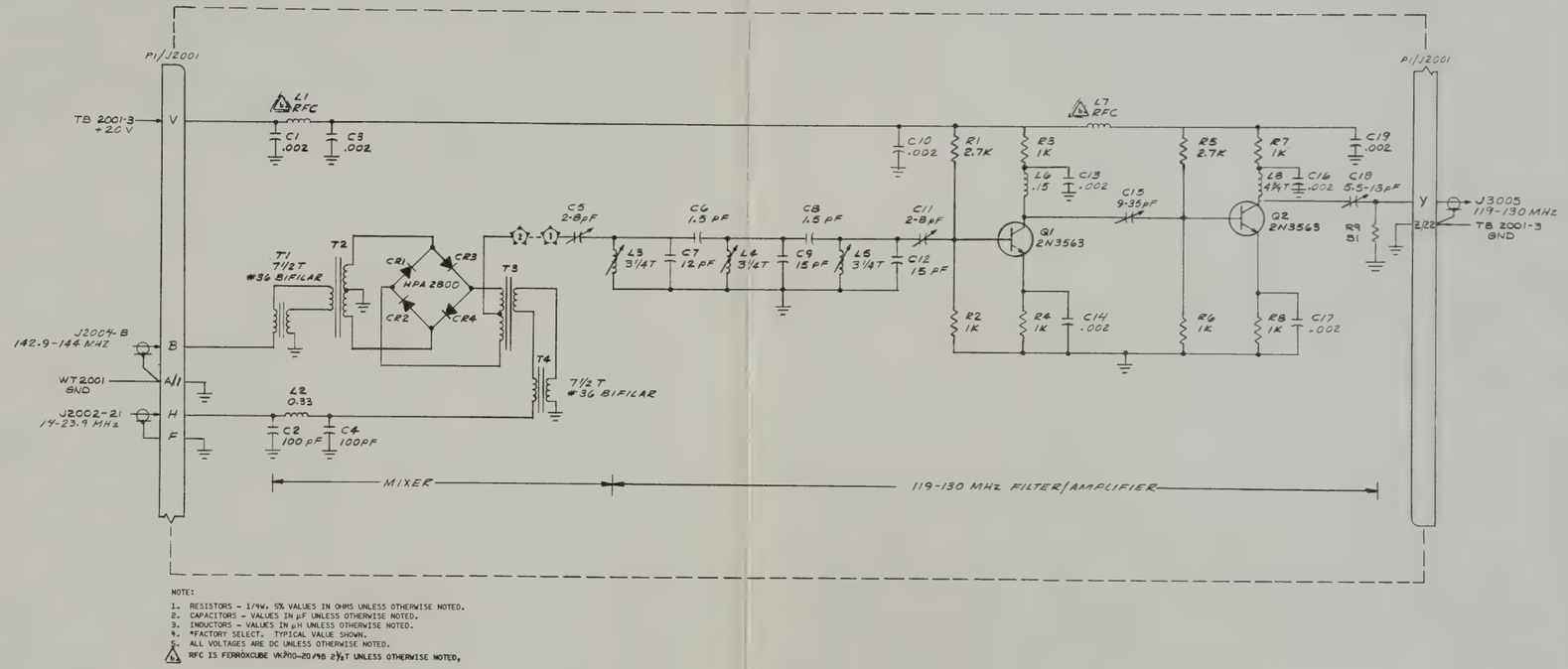
Figure 6-5. 119 MHz - 130 MHz Mixer. 2100

6-17/6-18

119 MHz - 130 MHz MIXER (cont). 2100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSFORMER			
T1	Bifilar, Toroidal	1579-0025	Cushman	
T2	Toroid, Trifilar	1579-0017	Cushman	
T3	Toroid, Trifilar	1579-0017	Cushman	
T4	Bifilar, Toroidal	1579-0025	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q2	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563





NOTE:

1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

⚠4 RFC IS FERROXCUBE VK200-20/4B 2½T UNLESS OTHERWISE NOTED.

5601**0040

Figure 6-5. 119 MHz – 130 MHz Mixer. 2100

100 kHz VOLTAGE CONTROLLED OSCILLATOR. 2200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2200	V.C.O. 100 kHz P.C. Board Assy.	7001-0143	Cushman	
	P.C. Board	1780-0290	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Mica, 1000pF, ±5%, 100V	1002-0015	Elmenco	DM15-F-102J
C3	Mica, 1000pF, ±5%, 100V	1002-0015	Elmenco	DM15-F-102J
C4	Mica, 1000pF, ±5%, 100V	1002-0015	Elmenco	DM15-F-102J
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Elect, 500μF, 15V	1013-0014	Mallory	TC1505B
C10	Elect, 500μF, 15V	1013-0014	Mallory	TC1505B
C11	Elect, 500μF, 15V	1013-0014	Mallory	TC1505B
C12	Mica, 22pF, ±5%, 500V	1002-0023	Elmenco	DM15-C-220J
C13	Mica, 22pF, ±5%, 500V	1002-0023	Elmenco	DM15-C-220J
C14	Mica, 22pF, ±5%, 500V	1002-0023	Elmenco	DM15-C-220J
C15	Elect, 1.5μF, ±10%, 35V	1013-0001	Sprague	150D155X9035B2
C16	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C17	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C18	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C19	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C20	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C21	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C22	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-221J
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-221J
C25	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C26	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C27	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-221J
C28	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C30	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C31	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C32	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C33	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C34	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C35	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C36	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C37	Mica, 150pF, ±5%, 500V	1002-0021	Elmenco	DM15-F-151J
C38	Mica, 39pF, ±5%, 500V	1002-0018	Elmenco	DM15-E-390J
C39	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C40	Mica, 75pF, ±5%, 500V	1002-0025	Elmenco	DM15-E-750J
C41	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C42	Mica, 75pF, ±5%, 500V	1002-0025	Elmenco	DM15-E-750J
C43	Mica, 150pF, ±5%, 500V	1002-0021	Elmenco	DM15-F-151J
C44	Mica, 39pF, ±5%, 500V	1002-0018	Elmenco	DM15-E-390J
	COILS			
L1	Choke, 10μH, ±10%, molded	1585-0016	Delevan	1537-36
L2	Var, .9μH, ±5%, unshielded	1596-0043	Dale	IDH1041-25
L3	Var, 1.2μH, ±5%, unshielded	1596-0044	Dale	IDH1041-26
L4	Var, 1.7μH, ±5%, unshielded	1596-0046	Dale	IDH1041-28
L5	Choke, 10μH, ±10%, molded	1585-0016	Delevan	1537-36

100 kHz VOLTAGE CONTROLLED OSCILLATOR (cont). 2200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
L6	Choke, .47μH, ±20%, molded	1585-0031	Delevan	1537-06
L7	Choke, 2.2μH, ±10%, molded	1585-0013	Delevan	1537-20
L8	Choke, .56μH, ±10%, molded	1585-0036	Delevan	1840-07
L9	Choke, 2.7μH, ±10%, molded	1585-0049	Delevan	1537-22
L10	Choke, .47μH, ±20%, molded	1585-0031	Delevan	1537-06
L11	Choke, 2.2μH, ±10%, molded	1585-0013	Delevan	1537-20
	DIODES			
CR1	Si, Zener, 9.1V, ±5%, 1W	1281-0027	IRC	1N4739
CR2	Si, Zener, 9.1V, ±5%, 1W	1281-0027	IRC	1N4739
CR3	Si, Zener, 9.1V, ±5%, 1W	1281-0027	IRC	1N4739
CR4	Hi Cap Tuning, MV1658	1281-0051	MSI Electronics	MV1658
CR5	Hi Cap Tuning, MV1658	1281-0051	MSI Electronics	MV1658
CR6	Hi Cap Tuning, MV1658	1281-0051	MSI Electronics	MV1658
CR7	Hi Cap Tuning, MV1658	1281-0051	MSI Electronics	MV1658
CR8	Hi Cap Tuning, MV1658	1281-0051	MSI Electronics	MV1658
CR9	Hi Cap Tuning, MV1658	1281-0051	MSI Electronics	MV1658
	RESISTORS			
R1	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R2	Comp, 1.0k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R3	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R4	Comp, 1.0k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R6	Comp, 1.0k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R7	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R8	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R9	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R10	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R11	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R12	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R13	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R14	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R15	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R16	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R17	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R18	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R19	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R20	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R21	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R22	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R23	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R24	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R25	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R26	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R27	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R28	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R29	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R30	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R31	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R32	Comp, 3.6k, ±5%, 1/4W	1066-3625	Allen-Bradley	CB3625
R33	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R34	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R35	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615

100 kHz VOLTAGE CONTROLLED OSCILLATOR (cont). 2200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R36	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R37	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R38	Comp, 180Ω, ±5%, 1/4W	1066-1815	Allen-Bradley	CB1815
R39	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R40	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
	TRANSISTORS			
Q1	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q2	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q3	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q4	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q5	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q6	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563

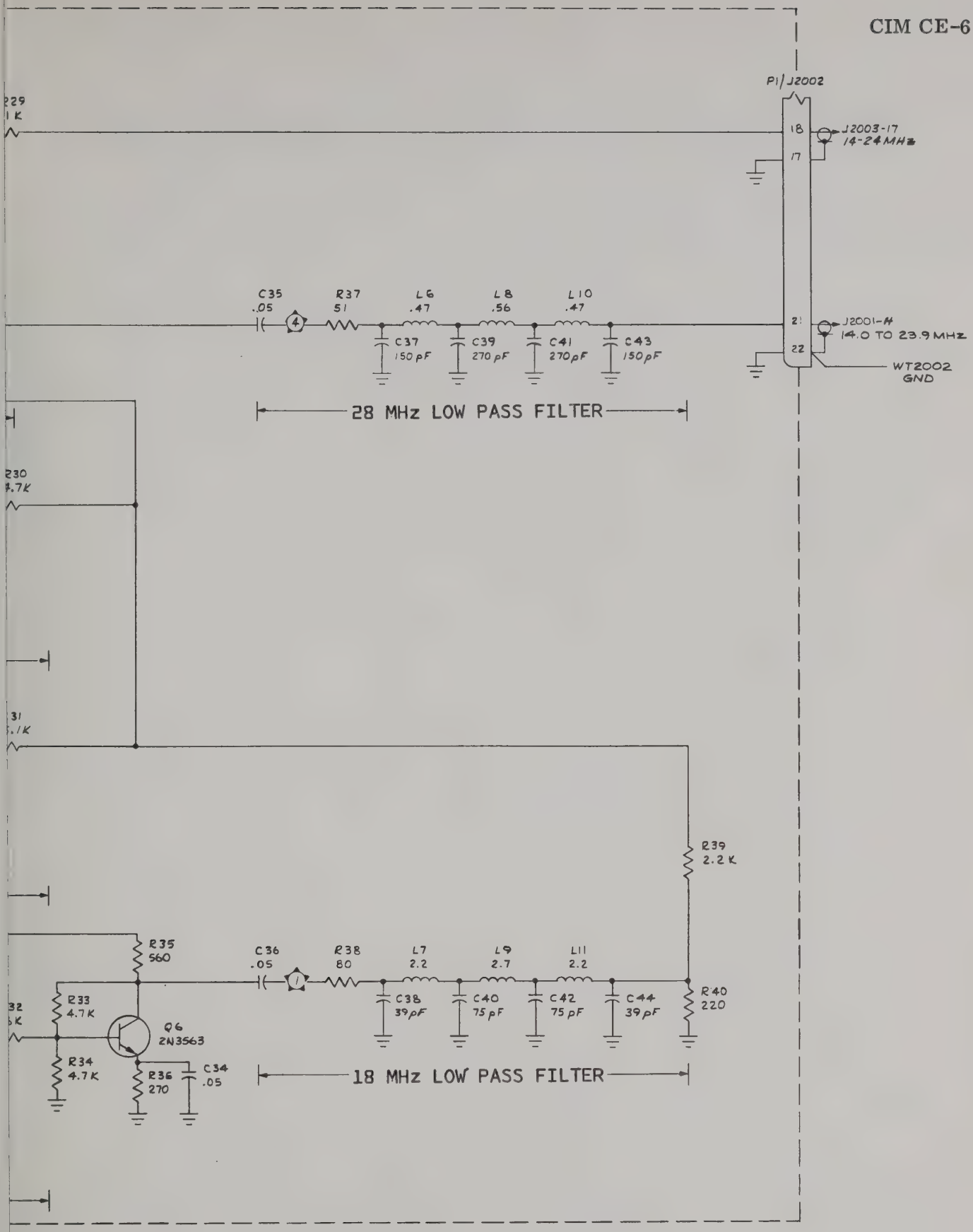
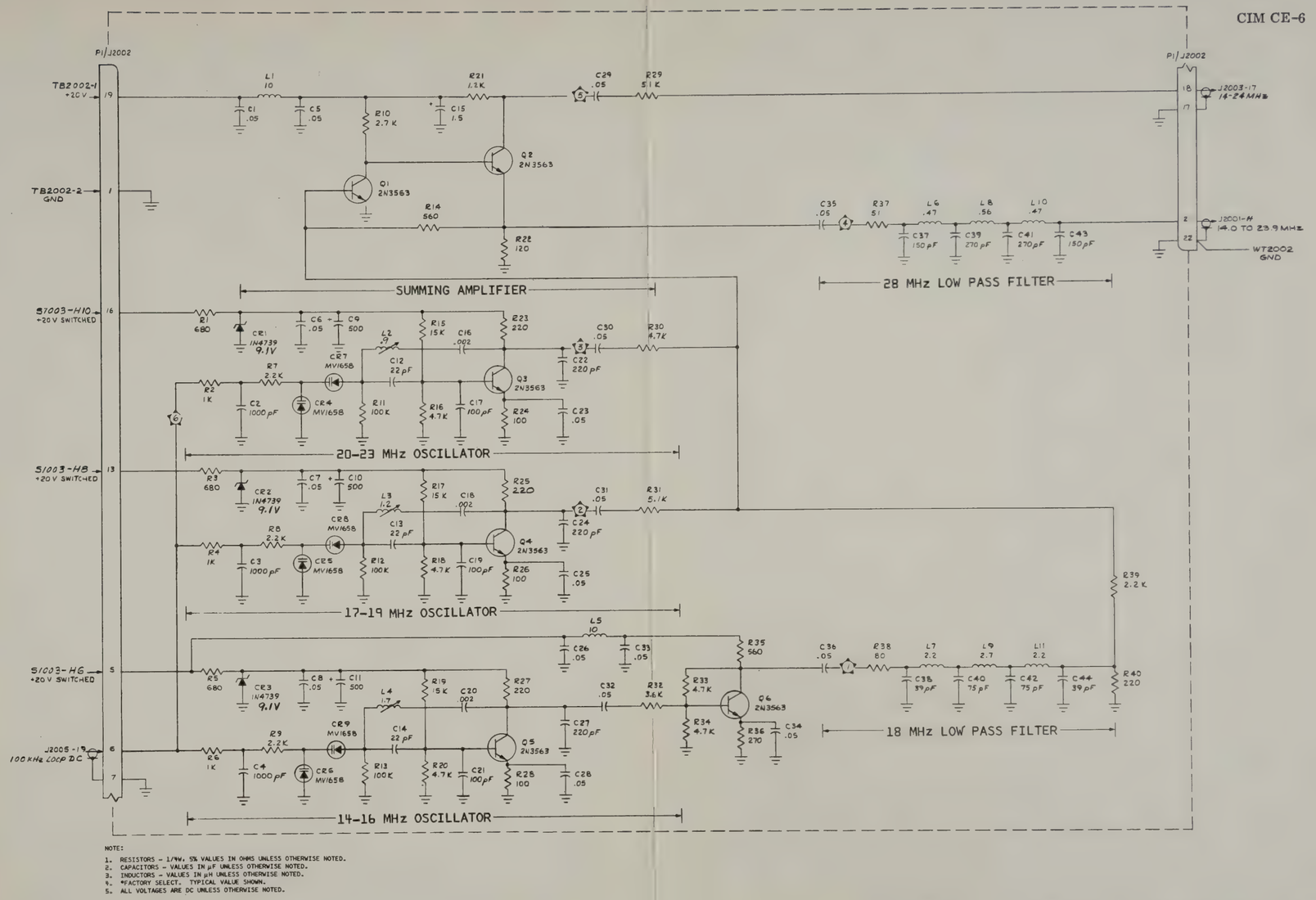


Figure 6-6. 100 kHz Voltage Controlled Oscillator. 2200

5601-0040



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-6. 100 kHz Voltage Controlled Oscillator. 2200

100 kHz DIVIDE-BY-N. 2300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2300	Divide-by-N, 100 kHz P.C. Board Assy.	7001-0144	Cushman	
	P.C. Board	1780-0299	Cushman	
	CAPACITORS			
C1	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
	COILS			
L1	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L2	Choke, 22μH, ±10%, molded	1585-0012	Delevan	1537-44
	INTEGRATED CIRCUITS			
IC1	I.C., 2N74196N	2025-0016	T.I.	SN74196N
IC2	I.C., 2N74196N	2025-0016	T.I.	SN74196N
IC3	I.C., 2N74196N	2025-0016	T.I.	SN74196N
IC4	I.C., 2N74196N	2025-0016	T.I.	SN74196N
IC5	Dual 4 input Nand Gate	2025-0008	T.I.	SN7420N
IC6	Triple 3-input And Gate	2025-0017	T.I.	SN74H11N
IC7	TTL Dual Flip-Flop	2025-0023	T.I.	SN74H72N
	RESISTORS			
R1	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R2	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R3	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R4	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R5	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R6	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R7	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R8	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R9	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R10	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R11	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R12	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R13	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
	TRANSISTOR			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275

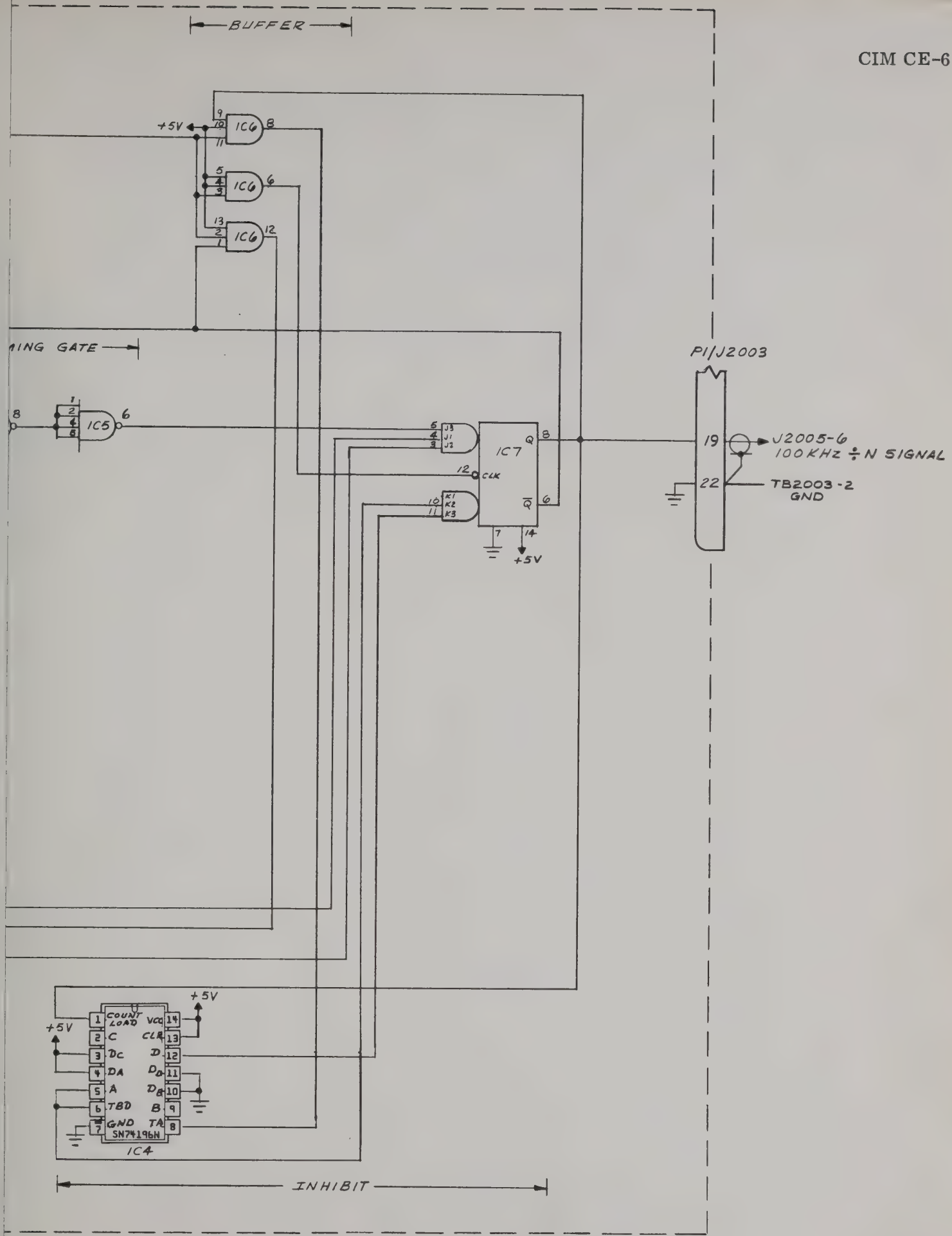
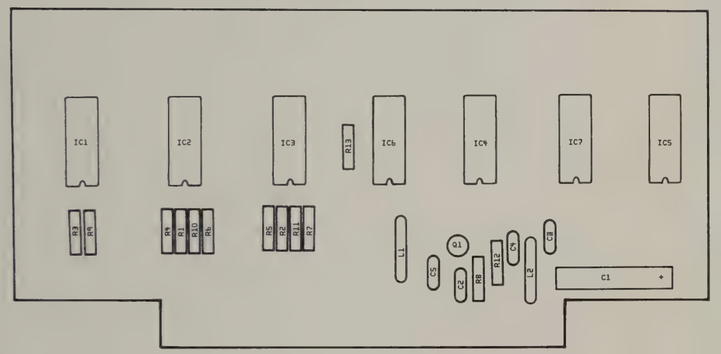
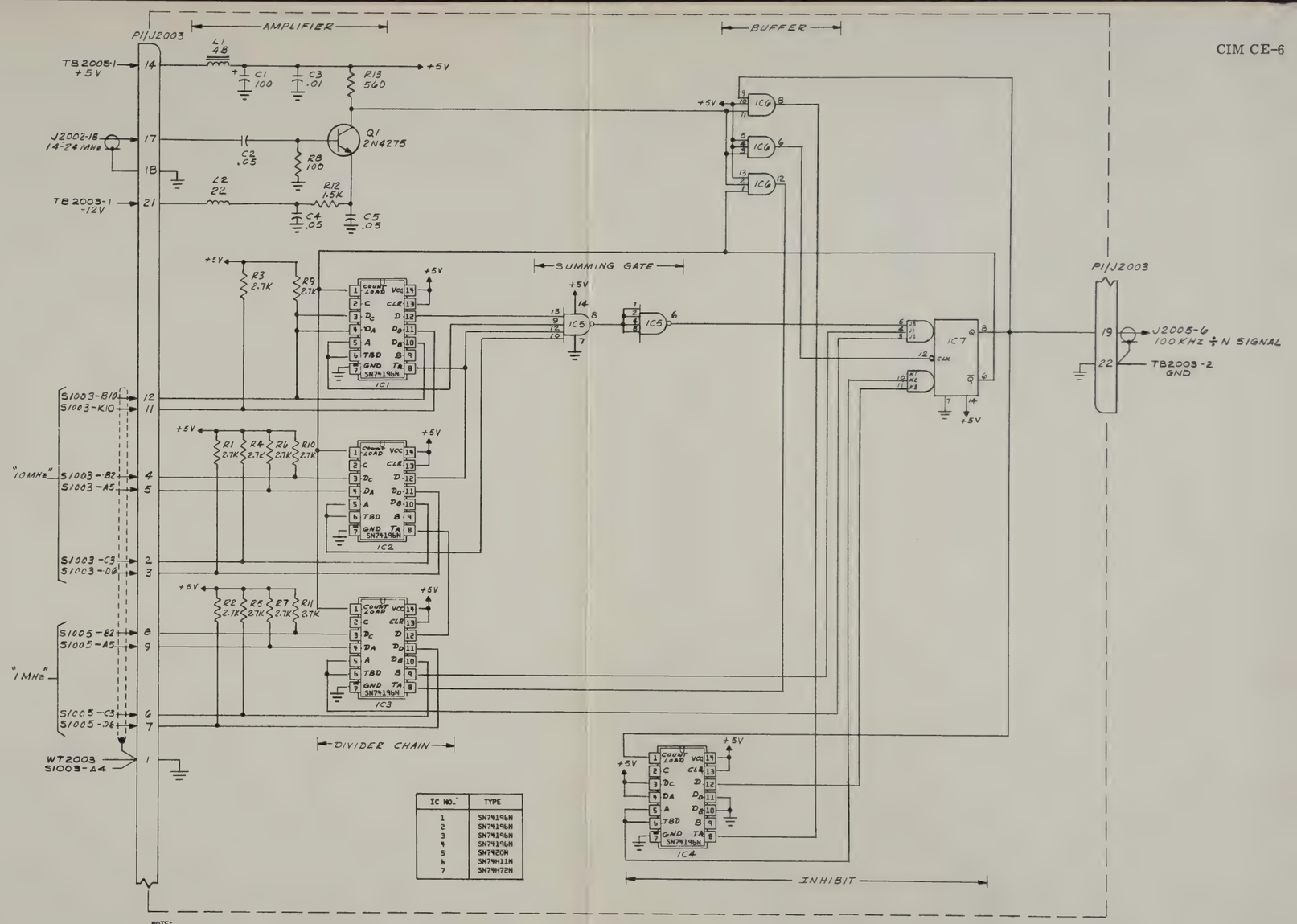


Figure 6-7. 100 kHz Divide-by-N. 2300





IC NO.	TYPE
1	SN74196N
2	SN74196N
3	SN74196N
4	SN74196N
5	SN74H20N
6	SN74H11N
7	SN74H72N

NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

5601**0040

Figure 6-7. 100 kHz Divide-by-N. 2300

142.9 MHz - 144 MHz MIXER. 2400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2400	Mixer, 142.9 MHz-144 MHz			
	P.C. Board Assy.	7001-0145	Cushman	
	P.C. Board	1780-0261	Cushman	
	CAPACITORS			
C1	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C2	Cer Tub, 3.3pF, ±.25pF, 500V	1005-0011	Erie	301-000-C0J0-339C
C3	Mica, 10pF, ±5%, 500V	1002-0016	Elmenco	DM15-C-100J
C4	Cer Tub, .68pF, .25pF, 500V	1005-0039	Erie	301-000-C0K0-688C
C5	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C6	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C7	Cer Tub, 3.3pF, ±.25pF, 500V	1005-0011	Erie	301-000-C0J0-339C
C8	Mica, 10pF, ±5%, 500V	1002-0016	Elmenco	DM15-C-100J
C9	Mica, 22pF, ±5%, 500V	1002-0023	Elmenco	DM15-C-220J
C10	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C11	Mica, 5pF, ±.5pF, 500V	1002-0028	Elmenco	DM15-C-050D
C12	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C13	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C14	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C15	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C16	Mica, 22pF, ±5%, 500V	1002-0023	Elmenco	DM15-C-220J
C17	Mica, 5pF, ±.5pF, 500V	1002-0028	Elmenco	DM15-C-050D
C18	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
	COILS			
L1	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L2	Var, 3 1/4 turn	1596-0052	Cushman	
L3	Var, 3 1/4 turn	1596-0052	Cushman	
L4	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L5	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L6	Var, 1 3/4 turn	1596-0051	Cushman	
L7	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L8	Var, 1 3/4 turn	1596-0051	Cushman	
L9	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
	DIODES			
CR1	Diode, HP2800	1283-0001	HPA	5082-2800
CR2	Diode, HP2800	1283-0001	HPA	5082-2800
CR3	Diode, HP2800	1283-0001	HPA	5082-2800
CR4	Diode, HP2800	1283-0001	HPA	5082-2800
	RESISTORS			
R1	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R2	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R3	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R4	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R5	Comp, 4.7Ω, ±5%, 1/4W	1066-0001	Allen-Bradley	CB47G5
R6	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R7	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R8	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R9	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725

142.9 MHz - 144 MHz MIXER (cont). 2400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSFORMER			
T1	Bifilar, Toroidal	1579-0025	Cushman	
T2	Toroid, Trifilar	1579-0017	Cushman	
T3	Toroid, Trifilar	1579-0017	Cushman	
T4	Bifilar, Toroidal	1579-0025	Cushman	
	TRANSISTORS			
Q1	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q2	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121

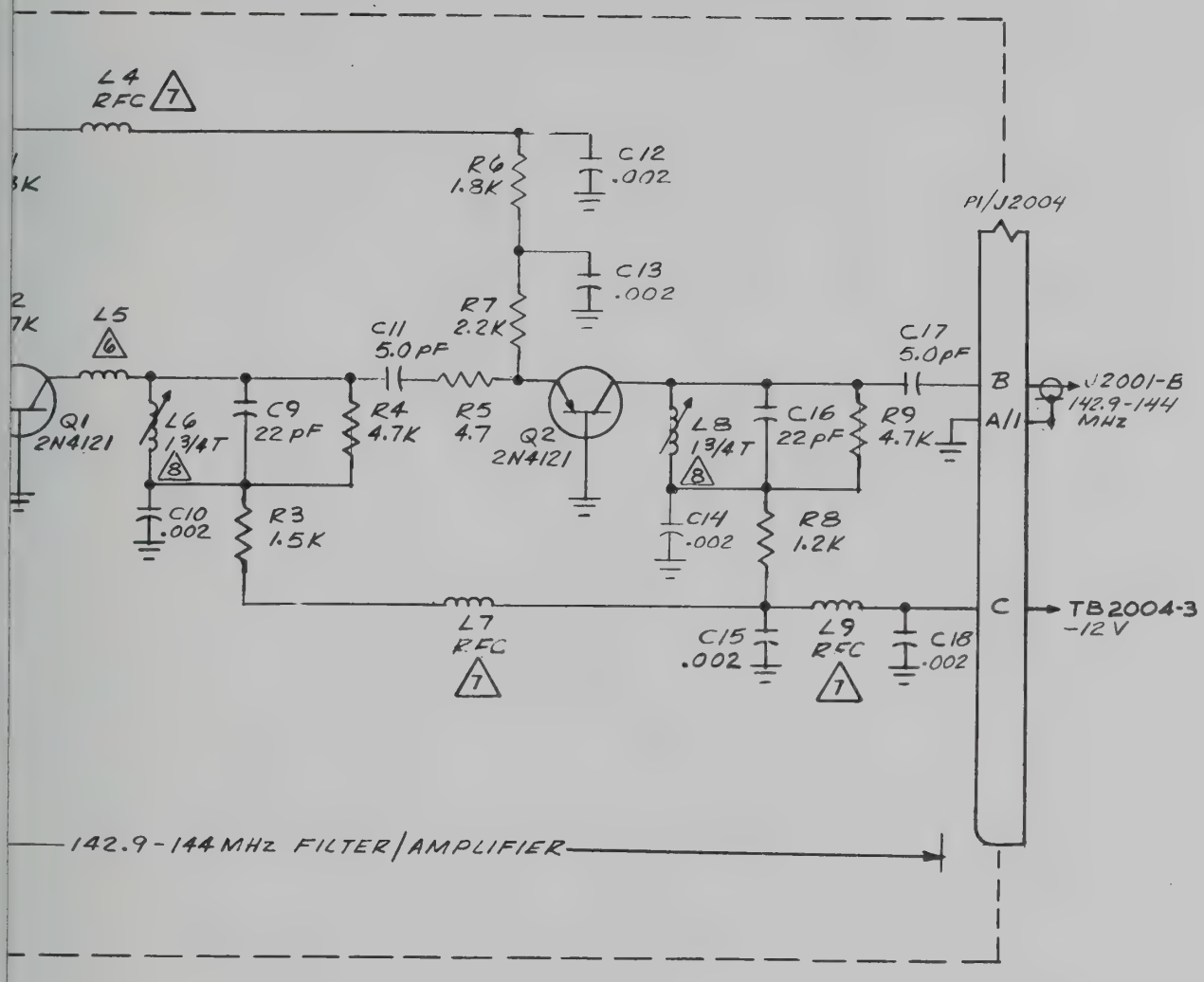
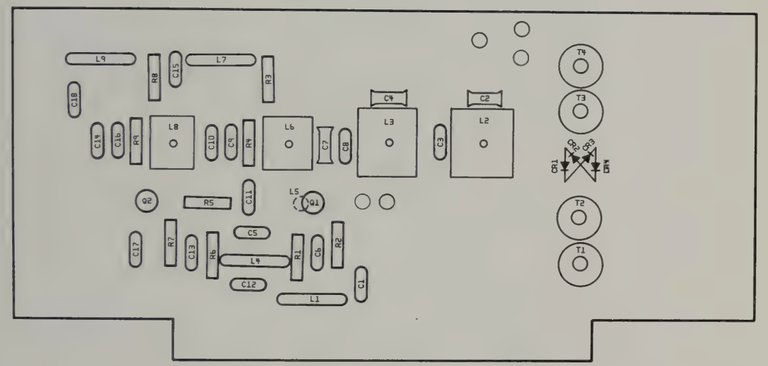
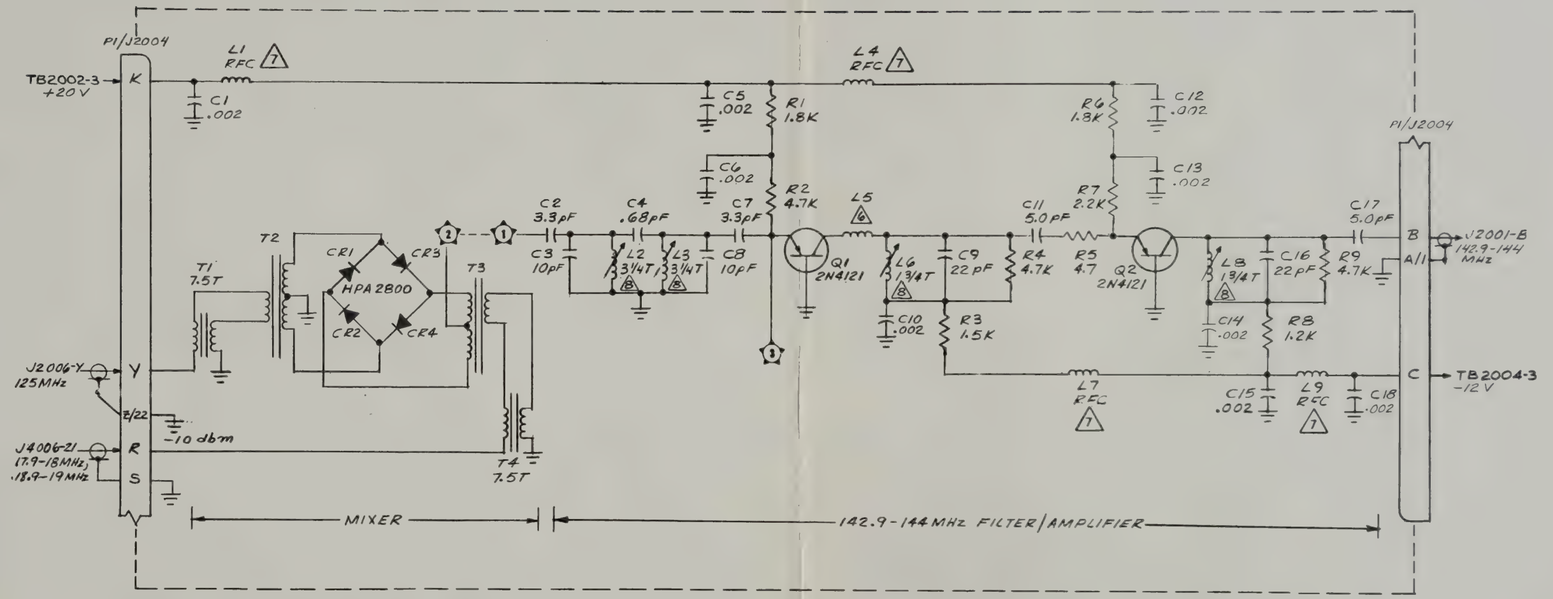


Figure 6-8. 142.9 MHz - 144 MHz Mixer. 2400

142.9 MHz - 144 MHz MIXER (cont). 2400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSFORMER			
T1	Bifilar, Toroidal	1579-0025	Cushman	
T2	Toroid, Trifilar	1579-0017	Cushman	
T3	Toroid, Trifilar	1579-0017	Cushman	
T4	Bifilar, Toroidal	1579-0025	Cushman	
	TRANSISTORS			
Q1	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q2	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121





NOTE:

1. RESISTORS - 1/4W. 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. FERRITE BEAD.
7. RFC IS FERROXCUBE VK200-20 4B 2½T OR EQUIV.
8. #20 WIRE.

Figure 6-8. 142.9 MHz - 144 MHz Mixer. 2400

100 kHz PHASE DETECTOR. 2500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2500	Phase Detector, 100 kHz			
	P.C. Board Assy.	7001-0146	Cushman	
	P.C. Board	1780-0298	Cushman	
	CAPACITORS			
C1	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C2	Elect, 500μF, 15V	1013-0014	Mallory	TC1505B
C3	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C4	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C5	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C6	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C7	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C8	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C9	Elect, 15μF, +75-10%, 12V	1013-0015	Sprague	30D156G012BA5
C10	Mica, 1000pF, ±5%, 100V	1002-0015	Elmenco	DM15-F-102J
C11	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C12	Elect, 15μF, +75-10%, 12V	1013-0015	Sprague	30D156G012BA5
C13	Mica, 2000pF, ±5%, 500V	1002-0077	Elmenco	DM15-E-202J
C14	Mica, 2000pF, ±5%, 500V	1002-0077	Elmenco	DM15-E-202J
C15	Elect, 15μF, +75-10%, 12V	1013-0015	Sprague	30D156G012BA5
C16	Mica, 1000pF, ±5%, 100V	1002-0015	Elmenco	DM15-F-102J
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Elect, 1μF, ±10%, 25V	1013-0004	Sprague	30D105G025BA5
C19	Elect, .47μF, ±10%, 50V	1008-0038	Electrocube	210B1A47AK
	COILS			
L1	Choke, 6.8μH, ±10%	1585-0015	Delevan	1537-32
L2	R.F. Choke, 47μH	1585-0044	Cambion	3635-57
L3	R.F. Choke, 47μH	1585-0044	Cambion	3635-57
L4	R.F. Choke, 47μH	1585-0044	Cambion	3635-57
	DIODE			
CR1	Diode, FD111	1281-0001	Fairchild	FD111
	INTEGRATED CIRCUITS			
IC1	TTL Nand Gates, SN7400N	2025-0003	T.I.	SN7400N
IC2	TTL Nand Gates, SN7400N	2025-0003	T.I.	SN7400N
IC3	TTL Nand Gates, SN7400N	2025-0003	T.I.	SN7400N
IC4	Monostable, MC8601P	2025-0053	Motorola	MC 8601P
IC5	Quad, 2-input possitive Nor gate	2025-0059	T.I.	SN7402N
IC6	Monostable, MC8601P	2025-0053	Motorola	MC 8601P
IC7	WideBand Op Amp, HA-2911	2025-0033	Harris-Semi.	HA-2911-5
	RESISTORS			
R1	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R2	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R3	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R4	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R5	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625

100 kHz PHASE DETECTOR (cont). 2500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R6	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R7	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R8	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R9	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R10	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R11	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R12	Pot, Cer trim, 10k, ±10%, 3/4W	1215-0014	Helitrim	89 WR
R13	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R14	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R15	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
C16	Comp, 220Ω, ±5%, 1/2W	1067-2215	Allen-Bradley	EB2215
	TRANSISTORS			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, NPN, 2N3642	1272-0018	Fairchild	2N3642

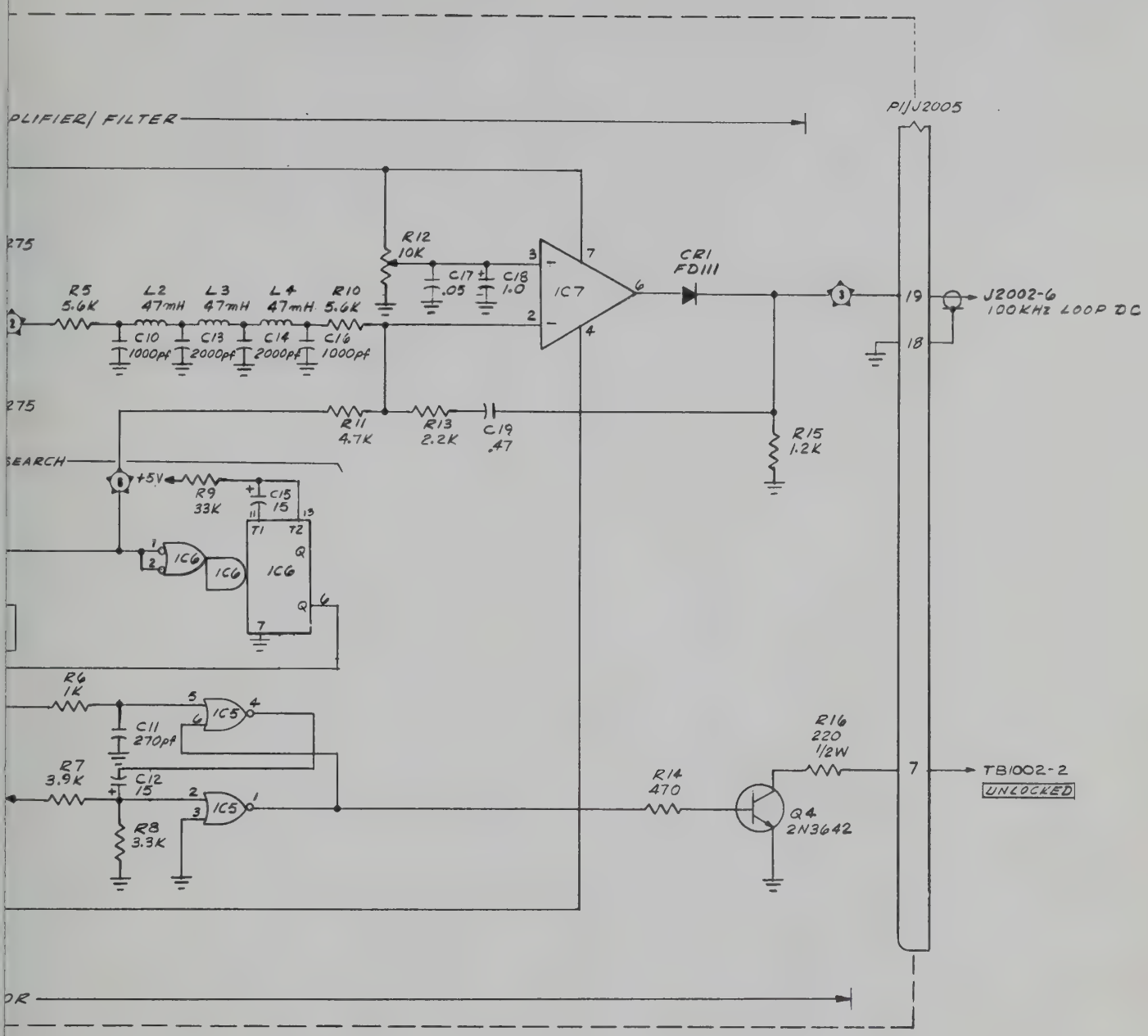
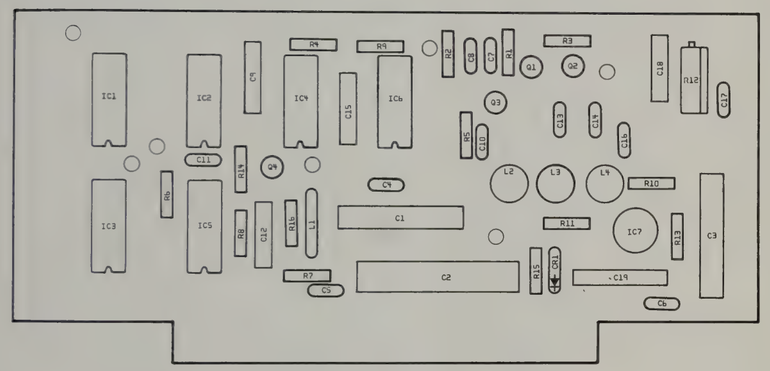
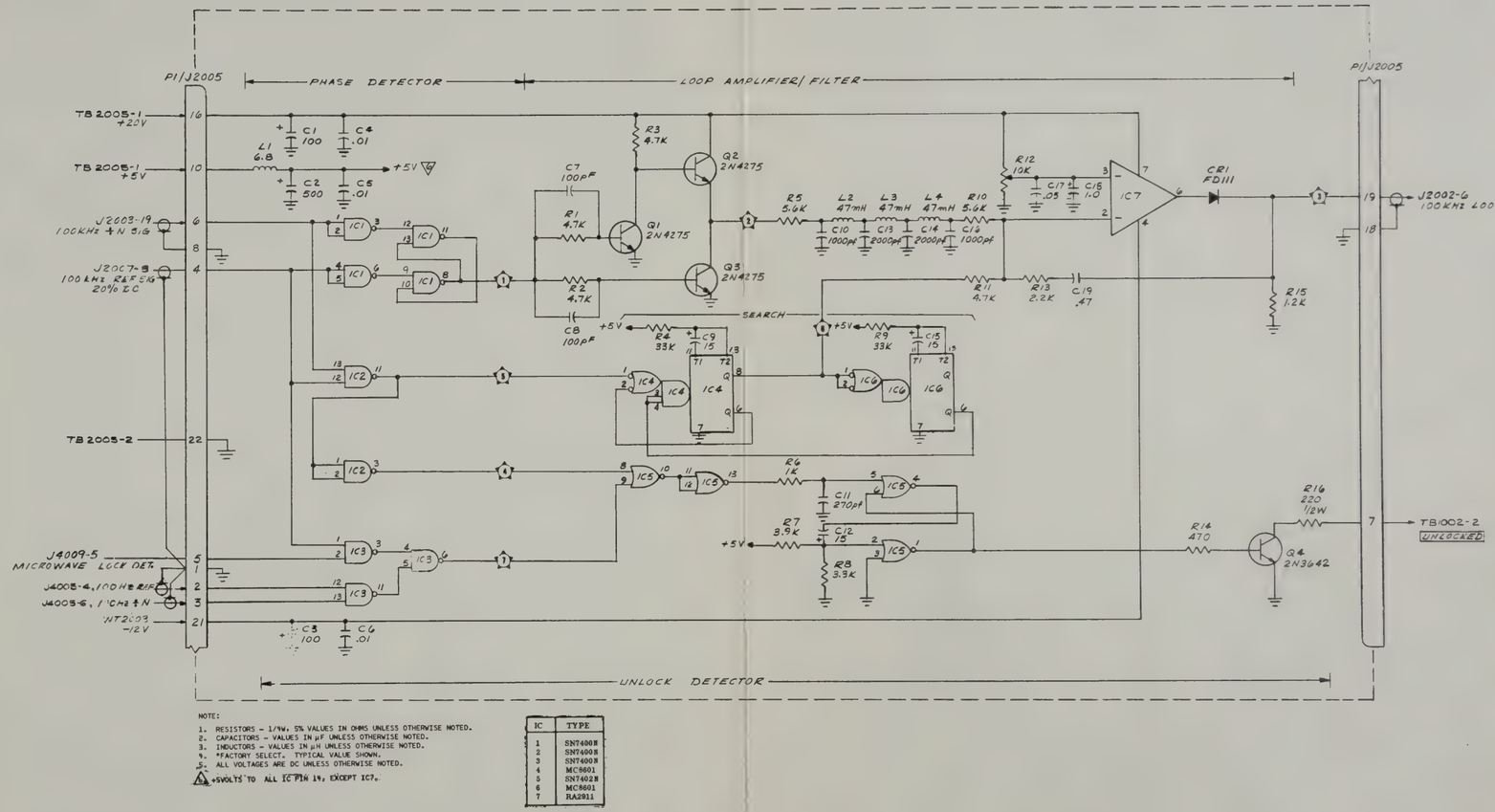


Figure 6-9. 100 kHz Phase Detector. 2500

100 kHz PHASE DETECTOR (cont). 2500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R6	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R7	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R8	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R9	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R10	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R11	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R12	Pot, Cer trim, 10k, ±10%, 3/4W	1215-0014	Helitrim	89 WR
R13	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R14	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R15	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
C16	Comp, 220Ω, ±5%, 1/2W	1067-2215	Allen-Bradley	EB2215
	TRANSISTORS			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, NPN, 2N3642	1272-0018	Fairchild	2N3642





NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

⚠ +5VOLTS TO ALL IC PIN 14, EXCEPT IC7.

IC	TYPE
1	SN7400N
2	SN7400N
3	SN7400N
4	MC8601
5	SN7402N
6	MC8601
7	RA2911

Figure 6-9. 100 kHz Phase Detector. 2500 6-35/6-36

5601--0040

FREQUENCY MULTIPLIER. 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2600	Multiplier, Frequency			
	P.C. Board	7001-0147	Cushman	
	P.C. Board	1780-0297	Cushman	
	CAPACITORS			
C1	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C2	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C3	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C4	Mica, 30pF, ±5%, 500V	1004-0010	Cornl Dubilier	CD10ED300J
C5	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C6	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C7	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C8	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C9	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C10	Not Used			
C11	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C12	Not Used			
C13	Mica, 390pF, ±5%, 100V	1004-0017	Cornl Dubilier	CD10FA391J
C14	Mica, 240pF, ±5%, 500V	1002-0030	Elmenco	DM15-F-241J
C15	Mica, 10pF, ±5%, 500V	1002-0016	Elmenco	DM15-C-100J
C16	Mica, 51pF, ±5%, 500V	1004-0012	Cornl Dubilier	CD10ED510J
C17	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C18	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C19	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C20	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C21	Mica, 10pF, ±5%, 500V	1002-0016	Elmenco	DM15-C-100J
C22	Mica, 240pF, ±5%, 500V	1004-0015	Cornl Dubilier	CD10FD241J
C23	Mica, 5pF, ±.5pF, 500V	1002-0028	Elmenco	DM15-C-050D
C24	Mica, 390pF, ±5%, 100V	1004-0017	Cornl Dubilier	CD10FA391J
C25	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C26	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C27	Mica, 15pF, ±5%, 500V	1002-0001	Elmenco	DM15-C-150J
C28	Mica, 240pF, ±5%, 500V	1004-0015	Cornl Dubilier	CD10FD241J
C29	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C30	Mica, 27pF, ±5%, 500V	1004-0009	Cornl Dubilier	CD10ED270J
C31	Mica, 390pF, ±5%, 100V	1004-0017	Cornl Dubilier	CD10FA391J
C32	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C33	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C34	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C35	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C36	Mica, 240pF, ±5%, 500V	1004-0015	Cornl Dubilier	CD10FD241J
C37	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C38	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C39	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C40	Mica, 22pF, ±5%, 500V	1002-0023	Elmenco	DM15-C-220J
C41	Mica, 22pF, ±5%, 500V	1002-0023	Elmenco	DM15-C-220J
C42	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C43	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C44	Cer Tub, 2.2pF, ±.25pF, 500V	1005-0017	Erie	301-000-C0J0-229C
C45	Mica, 30pF, ±5%, 500V	1004-0010	Cornl Dubilier	CD10ED300J
C46	Cer Tub, 2.2pF, ±.25pF, 500V	1005-0017	Erie	301-000-C0J0-229C
C47	Mica, 20pF, ±5%, 500V	1004-0008	Cornl Dubilier	CD10ED200J
C48	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C49	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C50	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M

FREQUENCY MULTIPLIER (cont). 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C51	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C52	Cer Tub, 2.2pF, ±.25pF, 500V	1005-0017	Erie	301-000-C0J0-229C
C53	Mica, 30pF, ±5%, 500V	1004-0010	Cornl Dubilier	CD10ED300J
C54	Cer Tub, 2.2pF, ±.25pF, 500V	1005-0017	Erie	301-000-C0J0-229C
C55	Mica, 20pF, ±5%, 500V	1004-0008	Cornl Dubilier	CD10ED200J
C56	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C57	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C58	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C59	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C60	Cer Tub, 1.5pF, ±.25pF, 500V	1005-0041	Erie	301-000-C0K0-159C
C61	Mica, 30pF, ±5%, 500V	1004-0010	Cornl Dubilier	CD10ED300J
C62	Cer Tub, 1.5pF, ±.25pF, 500V	1005-0041	Erie	301-000-C0K0-159C
C63	Mica, 20pF, ±5%, 500V	1004-0008	Cornl Dubilier	CD10ED200J
C64	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C65	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C66	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C67	Cer Trim, 2-8pF, 350V	1001-0004	Erie	538-002A-2-8-89A
C68	Mica, 30pF, ±5%, 500V	1004-0010	Cornl Dubilier	CD10ED300J
C69	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C70	Cer Trim, 2-8pF, 350V	1001-0004	Erie	538-002A-2-8-89A
C71	Mica, 20pF, ±5%, 500V	1004-0008	Cornl Dubilier	CD10ED200J
C72	Mica, 27pF, ±5%, 500V	1004-0009	Cornl Dubilier	CD10ED270J
C73	Mica, 270pF, ±5%, 300V	1004-0016	Cornl Dubilier	CD10FC271J
C74	Mica, 36pF, ±5%, 500V	1004-0011	Cornl Dubilier	CD10ED360J
C75	Mica, 68pF, ±5%, 500V	1004-0014	Cornl Dubilier	CD10ED680J
C76	Mica, 270pF, ±5%, 300V	1004-0016	Cornl Dubilier	CD10FC271J
C77	Mica, 56pF, ±5%, 500V	1004-0013	Cornl Dubilier	CD10ED560J
C78	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
	COILS			
L1	Choke, 180μH, ±5%, molded	1585-0035	Delevan	1537-88
L2	Choke, 180μH, ±5%, molded	1585-0035	Delevan	1537-88
L3	Choke, 180μH, ±5%, molded	1585-0035	Delevan	1537-88
L4	Choke, 15μH, ±10%, molded	1585-0034	Delevan	1437-40
L5	Not Used			
L6	Coil, 4 turns	1596-0010	Cushman	
L7	Coil, 4 turns	1596-0010	Cushman	
L8	Coil, 4 turns	1596-0010	Cushman	
L9	Coil, 4 turns	1596-0010	Cushman	
L10	Coil, 4 turns	1596-0010	Cushman	
L11	Coil, 4 turns	1596-0010	Cushman	
L12	Coil, 4 turns	1596-0010	Cushman	
L13	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK200-20/4B
L14	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK200-20/4B
L15	Coil, 2 1/2 turns, black	7050-0022	Cushman	
L16	Coil, 2 1/2 turns, black	7050-0022	Cushman	
L17	Coil, 2 1/2 turns, black	7050-0022	Cushman	
L18	Coil, 2 1/2 turns, black	7050-0022	Cushman	
L19	Coil, 2 1/2 turns, black	7050-0022	Cushman	
L20	Coil, 2 1/2 turns, black	7050-0022	Cushman	
L21	Coil, 2 1/2 turns, black	7050-0022	Cushman	
L22	Coil, 2 1/2 turns, black	7050-0022	Cushman	
L23	Choke, .08μH, 8 1/2 turns	1596-0057-02	Cushman	
L24	Choke, .56μH, ±10%, molded	1585-0036	Delevan	1840-07
L25	Choke, .06μH, 6 turns	1596-0057-01	Cushman	

FREQUENCY MULTIPLIER (cont). 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	INTEGRATED CIRCUITS			
IC1	TTL Nand Gates, SN7400N	2025-0003	T. I.	SN7400N
	RESISTORS			
R1	Comp, 110Ω, ±5%, 1/8W	1065-1115	Allen-Bradley	BB1115
R2	Comp, 2.2k, ±5%, 1/8W	1065-2225	Allen-Bradley	BB2225
R3	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R4	Comp, 220Ω, ±5%, 1/8W	1065-2215	Allen-Bradley	BB2215
R5	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R6	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R7	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R8	Comp, 1.3k, ±5%, 1/8W	1065-1325	Allen-Bradley	BB1325
R9	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R10	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R11	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R12	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R13	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R14	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R15	Comp, 3.9k, ±5%, 1/8W	1065-3925	Allen-Bradley	BB3925
R16	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R17	Comp, 3.9k, ±5%, 1/8W	1065-3925	Allen-Bradley	BB3925
R18	Comp, 3.9k, ±5%, 1/8W	1065-3925	Allen-Bradley	BB3925
R19	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R20	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R21	Comp, 560Ω, ±5%, 1/8W	1065-5615	Allen-Bradley	BB5615
R22	Comp, 3.3k, ±5%, 1/8W	1065-3325	Allen-Bradley	BB3325
R23	Comp, 220Ω, ±5%, 1/8W	1065-2215	Allen-Bradley	BB2215
R24	Comp, 3.9k, ±5%, 1/8W	1065-3925	Allen-Bradley	BB3925
R25	Comp, 3.9k, ±5%, 1/8W	1065-3925	Allen-Bradley	BB3925
R26	Comp, 3.9k, ±5%, 1/8W	1065-3925	Allen-Bradley	BB3925
R27	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R28	Comp, 10k, ±5%, 1/8W	1065-1035	Allen-Bradley	BB1035
R29	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R30	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R31	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R32	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R33	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R34	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R35	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R36	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R37	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R38	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R39	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R40	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R41	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R42	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R43	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R44	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R45	Comp, 560Ω, ±5%, 1/8W	1065-5615	Allen-Bradley	BB5615
R46	Comp, 2.2k, ±5%, 1/8W	1065-2225	Allen-Bradley	BB2225
R47	Comp, 4.7k, ±5%, 1/8W	1065-4725	Allen-Bradley	BB4725
R48	Comp, 560Ω, ±5%, 1/8W	1065-5615	Allen-Bradley	BB5615
R49	Comp, 220Ω, ±5%, 1/8W	1065-2215	Allen-Bradley	BB2215
R50	Comp, 220Ω, ±5%, 1/8W	1065-2215	Allen-Bradley	BB2215

FREQUENCY MULTIPLIER (cont). 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q4	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q5	Si, PNP, TIS 37	1271-0003	T. I.	TIS 37
Q6	Si, PNP, TIS 37	1271-0003	T. I.	TIS 37
Q7	Si, PNP, TIS 37	1271-0003	T. I.	TIS 37
Q8	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q9	Si, PNP, TIS 37	1271-0003	T. I.	TIS 37
Q10	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q11	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q12	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q13	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q14	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q15	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q16	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q17	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121

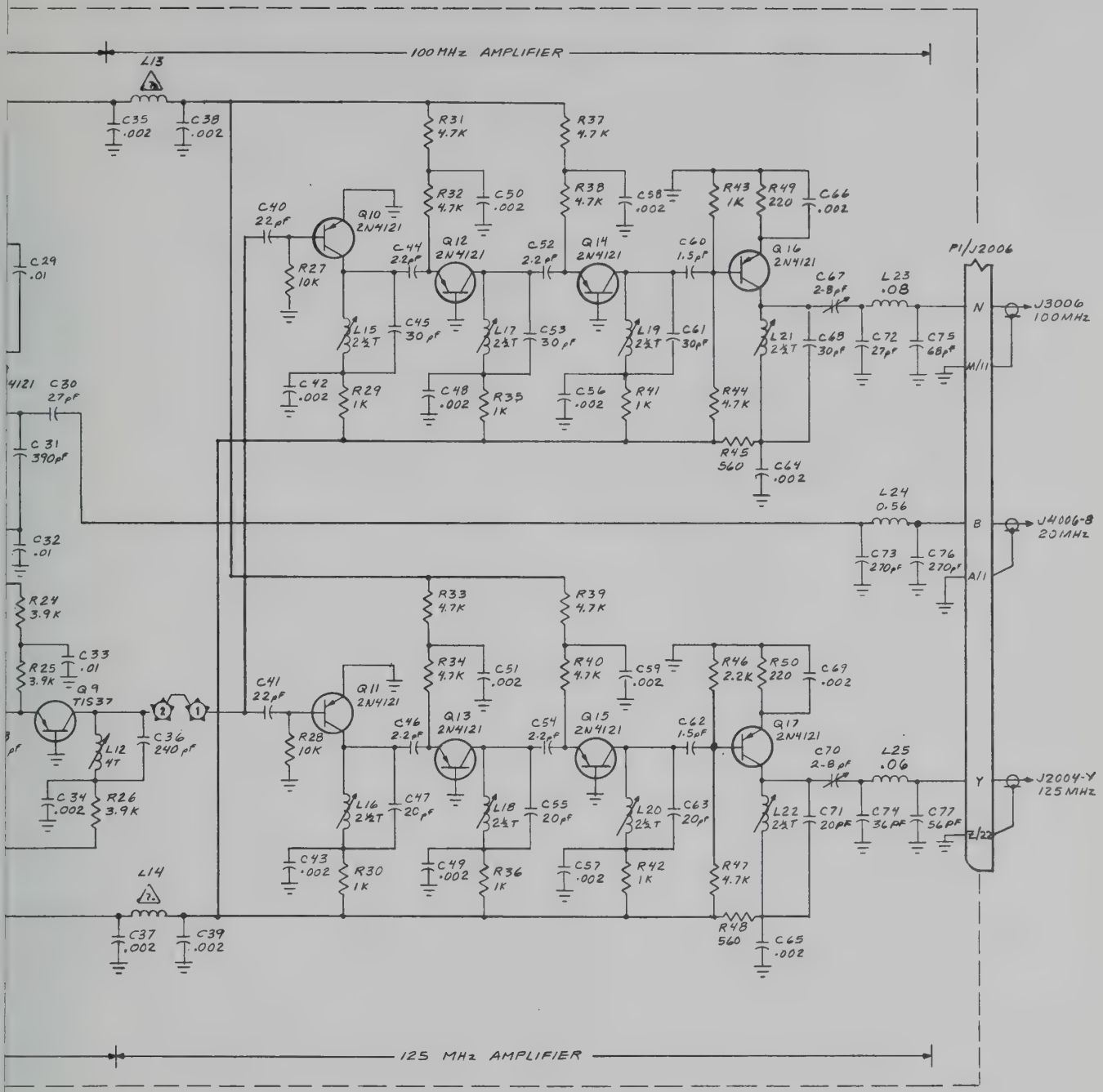
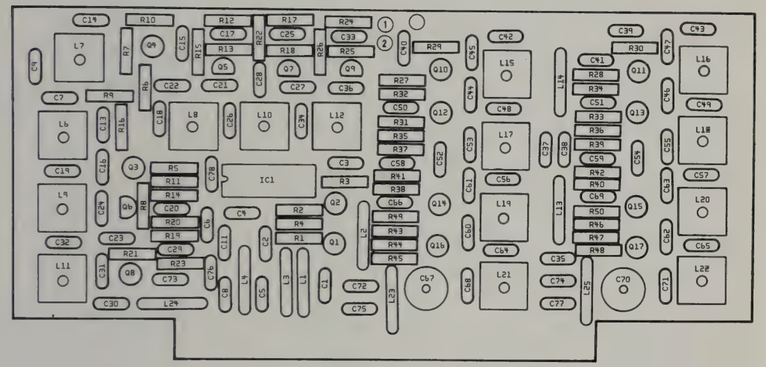
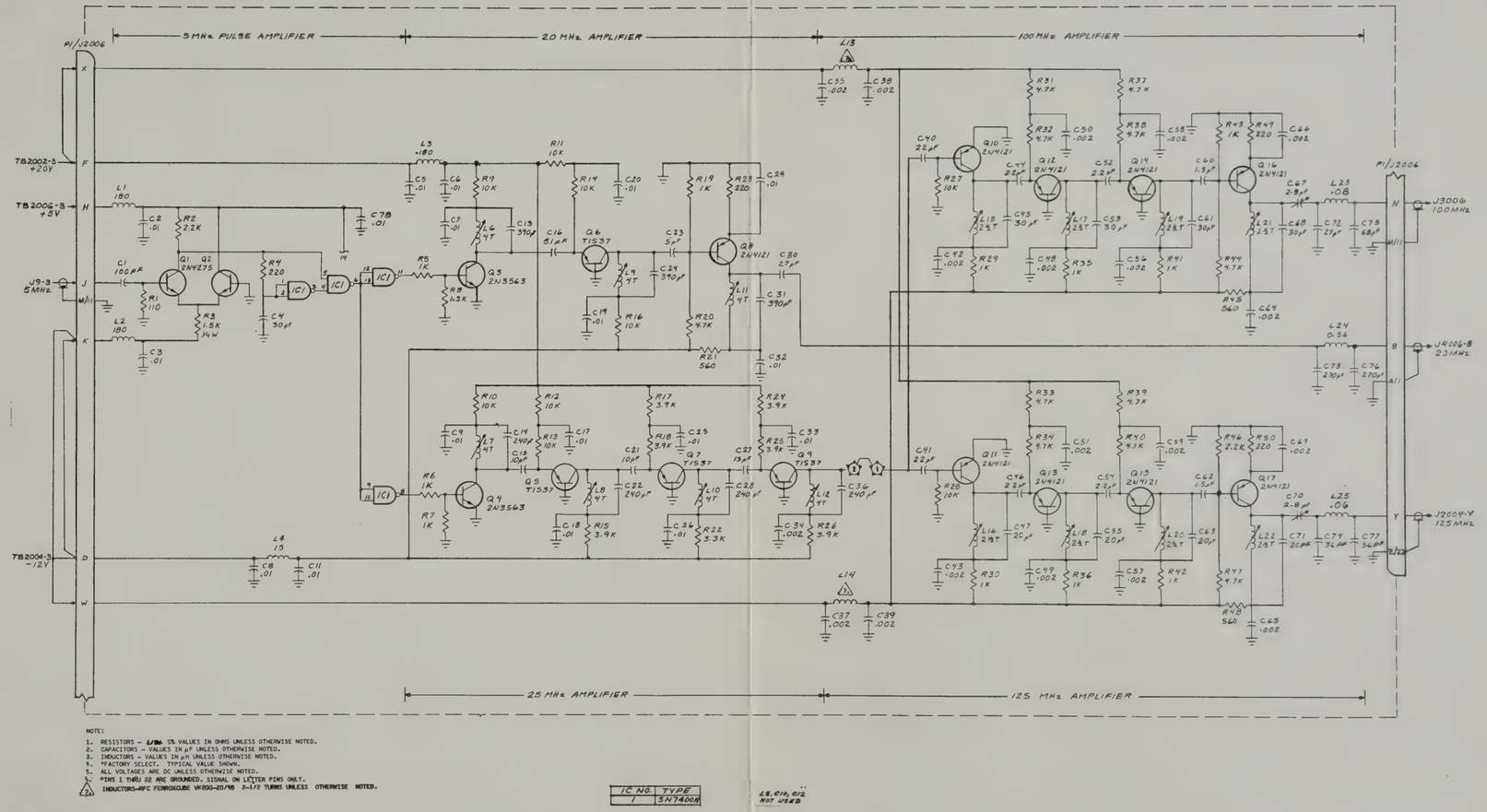


Figure 6-10. Frequency Multiplier. 2600

FREQUENCY MULTIPLIER (cont). 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q4	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q5	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q6	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q7	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q8	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q9	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q10	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q11	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q12	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q13	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q14	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q15	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q16	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q17	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121





NOTE:
1. RESISTORS – ±5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN µF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN µH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. PINS 1 THRU 22 ARE GROUNDED. SIGNAL ON LETTER PINS ONLY.
7. INDUCTORS-MFG FERROXCUBE VK200-20/4B 2-1/2 TURNS UNLESS OTHERWISE NOTED.

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Figure 6-10. Frequency Multiplier. 2600

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REFERENCE DIVIDER. 2700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2700	Reference Divider			
	P.C. Board Assy	7001-0148	Cushman	
	P.C. Board	1780-0302	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Not Used			
C8	Not Used			
C9	Not Used			
C10	Mica, 560pF, ±5%, 300V	1002-0037	Elmenco	DM15-F-561J
C11	Not Used			
C12	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Mica, 510pF, ±5%, 500V	1002-0036	Elmenco	DM15-F-511J
C15	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C16	Not Used			
C17	Mica, 12pF, ±5%, 500V	1002-0017	Elmenco	DM15-C-120J
C18	Not Used			
C19	Not Used			
C20	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C21	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C22	Mica, 510pF, ±5%, 500V	1002-0036	Elmenco	DM15-F-511J
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Mica, 12pF, ±5%, 500V	1002-0017	Elmenco	DM15-C-120J
C25	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C26	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C27	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C28	Mica, 510pF, ±5%, 500V	1002-0036	Elmenco	DM15-F-511J
C29	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C30	Mica, 12pF, ±5%, 500V	1002-0017	Elmenco	DM15-C-120J
C31	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C32	Mica, 36pF, ±5%, 500V	1002-0041	Elmenco	DM15-E-360J
C33	Mica, 620pF, ±5%, 300V	1002-0038	Elmenco	DM15-F-621J
C34	Poly, .0082μF, ±10%, 100V	1008-0015	Sprague	225P82291
C35	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C36	Mica, 390pF, ±5%, 500V	1002-0033	Elmenco	DM15-F-391J
C37	Mica, 15pF, ±5%, 500V	1002-0001	Elmenco	DM15-C-150J
C38	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C39	Mica, 390pF, ±5%, 500V	1002-0033	Elmenco	DM15-F-391J
C40	Poly, .0056μF, ±10%, 100V	1008-0022	Sprague	225P56291WA3
C41	Mica, 430pF, ±5%, 500V	1002-0034	Elmenco	DM15-F-431J
C42	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C43	Mica, 68pF, ±5%, 500V	1002-0013	Elmenco	DM15-E-680J
C44	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C45	Elect, 1μF, ±10%, 25V	1013-0004	Sprague	30D105G025BA5

REFERENCE DIVIDER (cont). 2700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	COILS			
L1	Choke, 680μH, ±5%, molded	1585-0023	Delevan	2500-20
L2	Choke, 47μH, ±5%, molded	1585-0010	Delevan	1537-60
L3	Choke, 680μH, ±5%, molded	1585-0023	Delevan	2500-20
L4	Choke, 2 1/2 turns	1586-0003	Ferroxcube	VK20020/4B
L5	Not Used			
L6	Coil, 21 turns	1596-0004	Cushman	
L7	Coil, 21 turns	1596-0004	Cushman	
C8	Choke, 2 1/2 turns	1586-0003	Ferroxcube	VK20020/4B
C9	Choke, 100μH, ±5%, molded	1585-0017	Delevan	1537-76
C10	Coil, 21 turns	1596-0004	Cushman	
C11	Coil, 21 turns	1596-0004	Cushman	
C12	Coil, 8 turns	1596-0011	Cushman	
C13	Coil, 8 turns	1596-0011	Cushman	
C14	Coil, 8 turns	1596-0011	Cushman	
	INTEGRATED CIRCUITS			
IC1	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC2	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC3	TTL Nand Gates, SN7400N	2025-0003	T.I.	SN7400N
IC4	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC5	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC6	TTL Nand Gates, SN7400N	2025-0003	T.I.	SN7400N
IC7	TTL Nand Gates, SN7400N	2025-0003	T.I.	SN7400N
	RESISTORS			
R1	Not Used			
R2	Not Used			
R3	Not Used			
R4	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R5	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R6	Not Used			
R7	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R8	Not Used			
R9	Not Used			
R10	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R11	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R12	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R13	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R14	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R15	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R16	Comp, 150Ω, ±5%, 1/4W	1066-1515	Allen-Bradley	CB1515
R17	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R18	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R19	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R20	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R21	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R22	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R23	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035

REFERENCE DIVIDER (cont). 2700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSFORMER			
T1	Toroid, Trifiliar	1579-0017	Cushman	
	TRANSISTORS			
Q1	Not Used			
Q2	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q3	Not Used			
Q4	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q5	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q6	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q7	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q8	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q9	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563

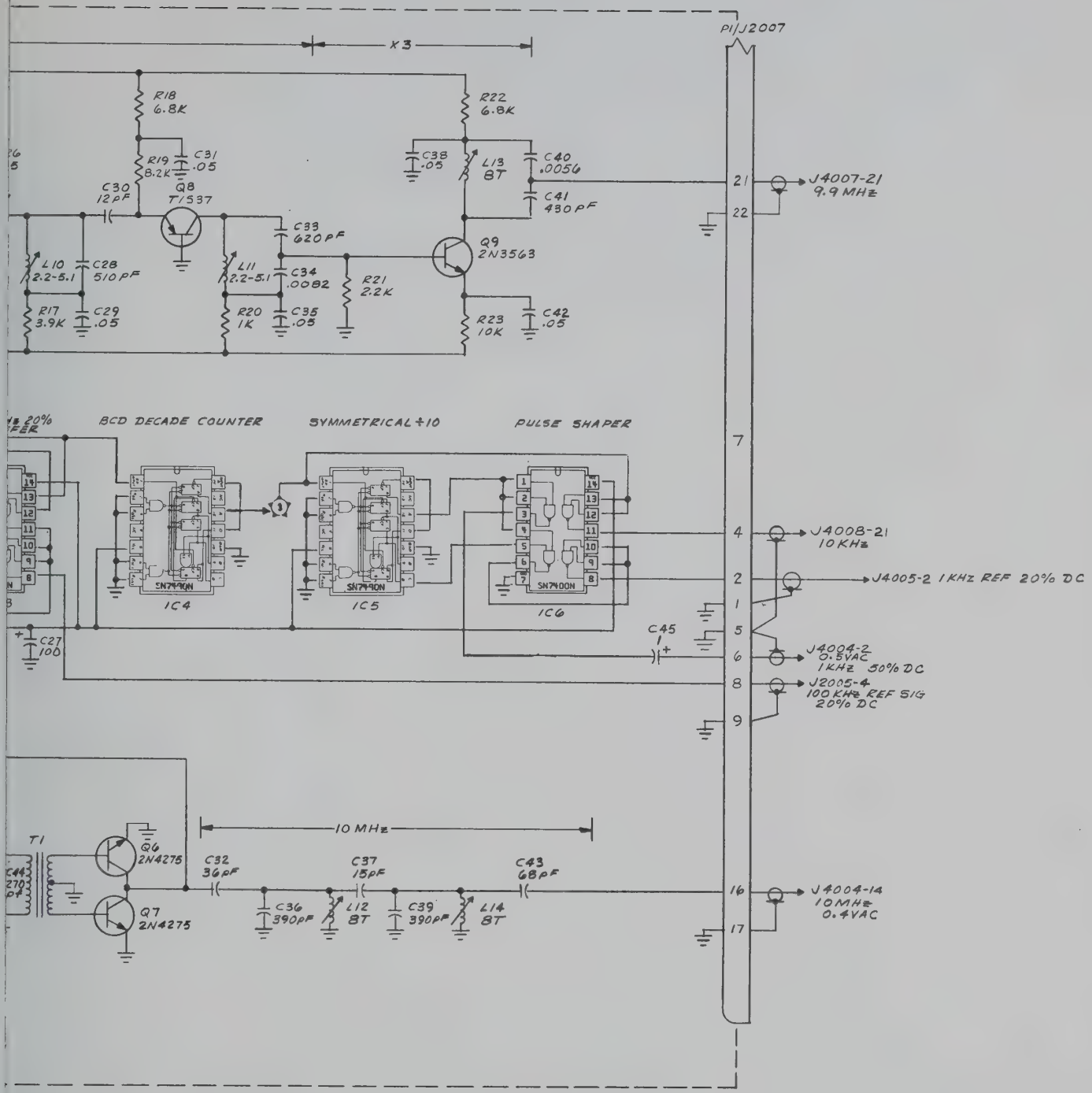

Figure 6-11. Reference Divider. 2700

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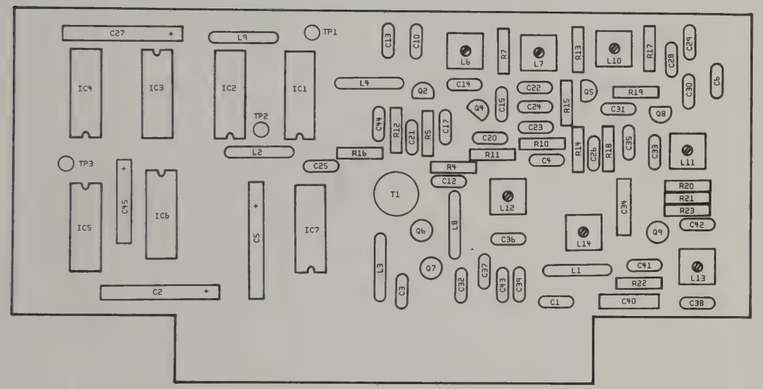

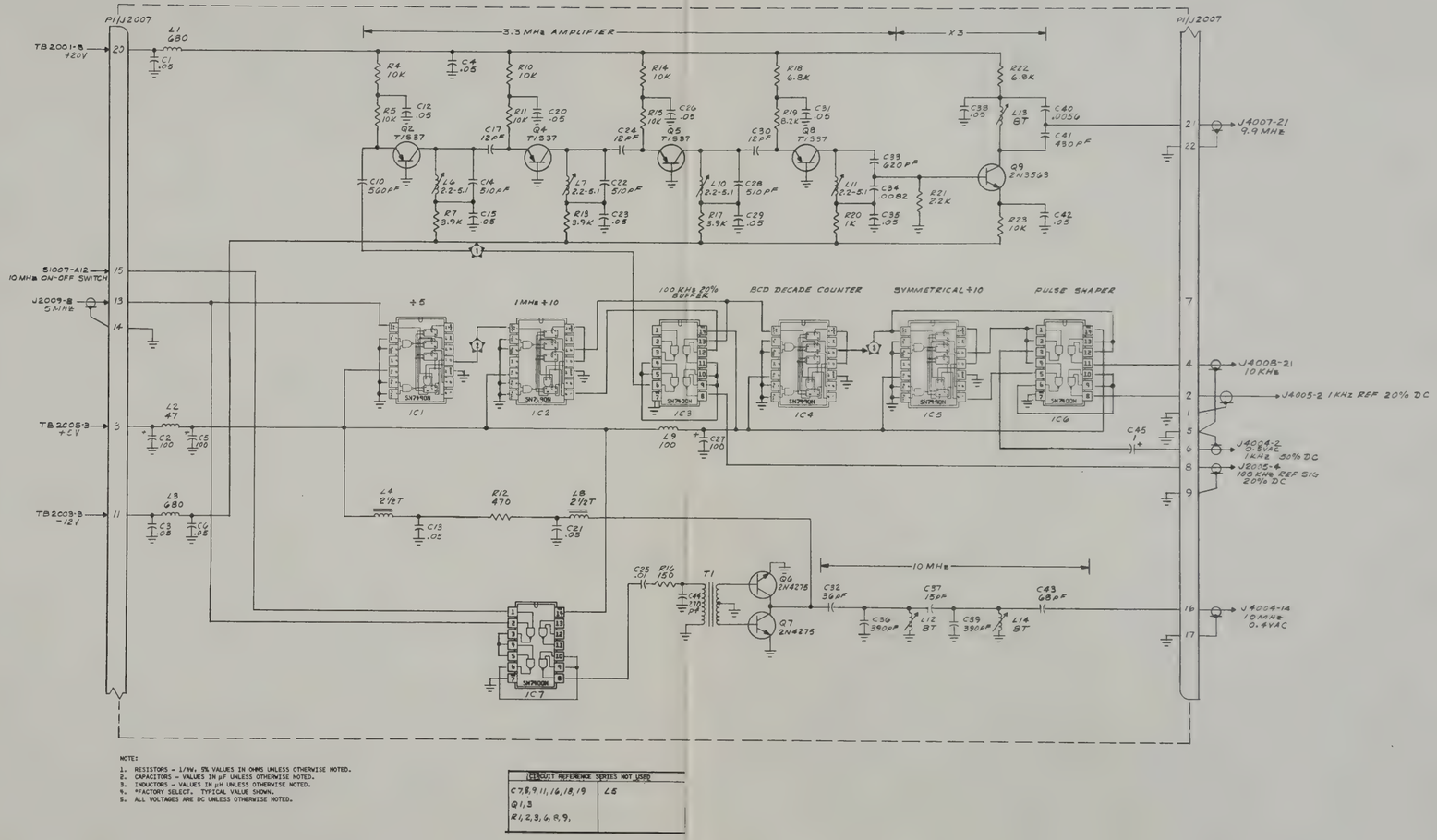

NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

CIRCUIT REFERENCE SERIES NOT USED	
C7,8,9,11,16,18,19	L5
Q1,3	
R1,2,3,6,8,9,	

5601-0040

Figure 6-11. Reference Divider. 2700
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1190 MHz - 1300 MHz REFERENCE VOLTAGE. 2800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2800	Reference Voltage, 1190-1300 MHz			
	P.C. Board Assy	7001-0149	Cushman	
	P.C. Board	1780-0313	Cushman	
	CAPACITORS			
C1	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C2	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C3	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C4	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
	DIODES			
CR1	Diode, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR2	Diode, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR3	Diode, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	INTEGRATED CIRCUITS			
IC1	Op Ampl LM301A	2025-0032	National	LM301A
	RESISTORS			
R1	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R2	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R3	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R4	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R5	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R6	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R7	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R8	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R9	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R10	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R11	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R12	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R13	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R14	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R15	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R16	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R17	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R18	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R19	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R20	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R21	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R22	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R23	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R24	Comp, 200k, ±5%, 1/4W	1066-2045	Allen-Bradley	CB2045
R25	Comp, 270k, ±5%, 1/4W	1066-2745	Allen-Bradley	CB2745
R26	Comp, 270k, ±5%, 1/4W	1066-2745	Allen-Bradley	CB2745
R27	Comp, 130k, ±5%, 1/4W	1066-1345	Allen-Bradley	CB1345
R28	Comp, 160k, ±5%, 1/4W	1066-1645	Allen-Bradley	CB1645
R29	Metal Film, 4.75k, ±1%, 1/8W	1075-0038	Dale	MFF 1/8 T1
R30	Metal Film, 4.75k, ±1%, 1/8W	1075-0038	Dale	MFF 1/8 T1
R31	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R32	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R33	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R34	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R35	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125

1190 MHz - 1300 MHz REFERENCE VOLTAGE (cont). 2800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R36	Comp, 11k, ±5%, 1/4W	1066-1135	Allen-Bradley	CB1135
R37	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R38	Thermistor, 1k	1253-0002	Veco	31E2
R39	Comp, 10 Meg, ±5%, 1/4W	1066-1065	Allen-Bradley	CB1065
R40	Comp, 10 Meg, ±5%, 1/4W	1066-1065	Allen-Bradley	CB1065
	TRANSISTORS			
Q1	N-Channel FET, 2N4392	1272-0054	Motorola	2N4392
Q2	N-Channel FET, 2N4392	1272-0054	Motorola	2N4392
Q3	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q4	Si, PNP, 2N3906	1272-0037	Motorola	2N3906

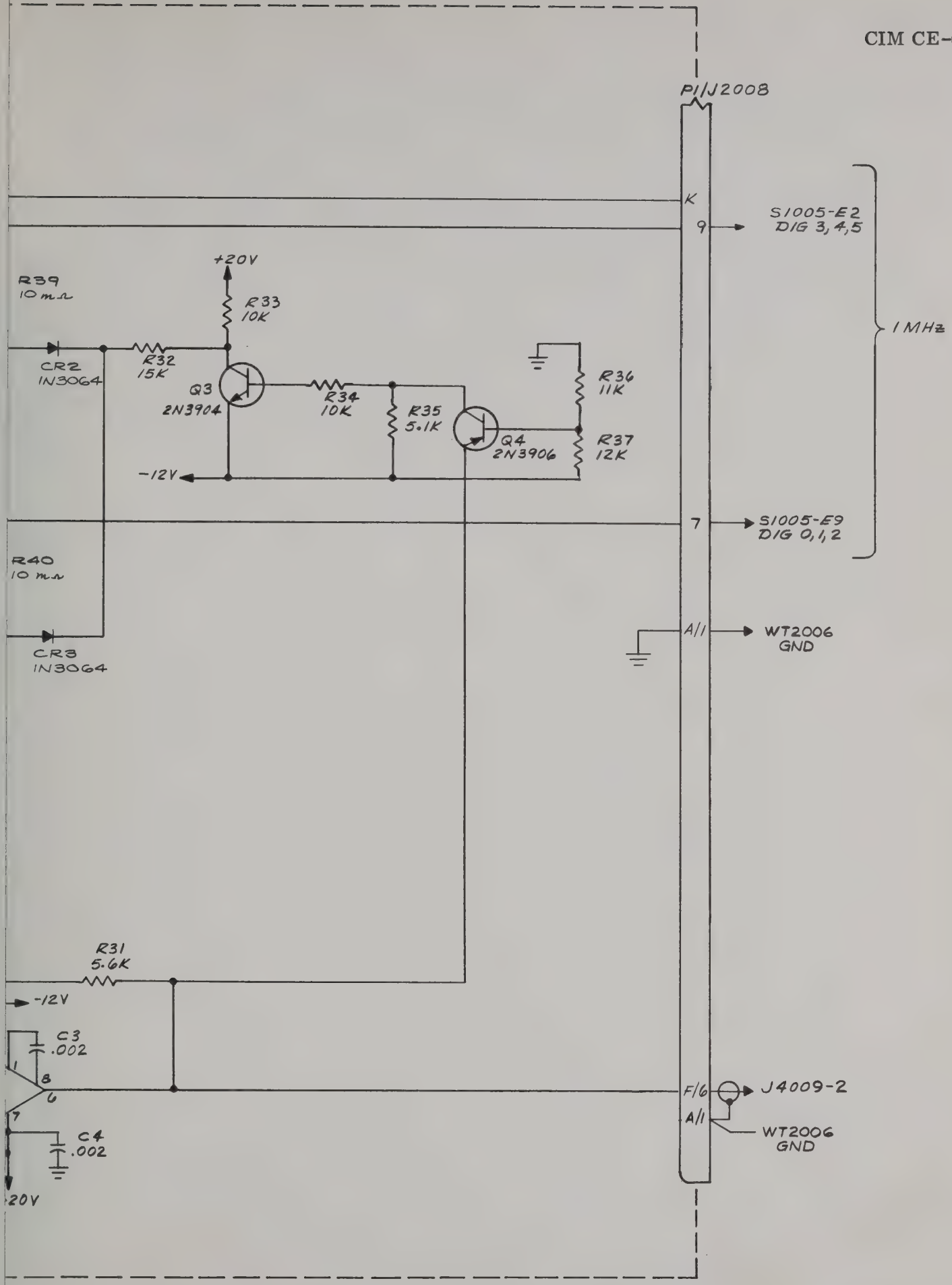
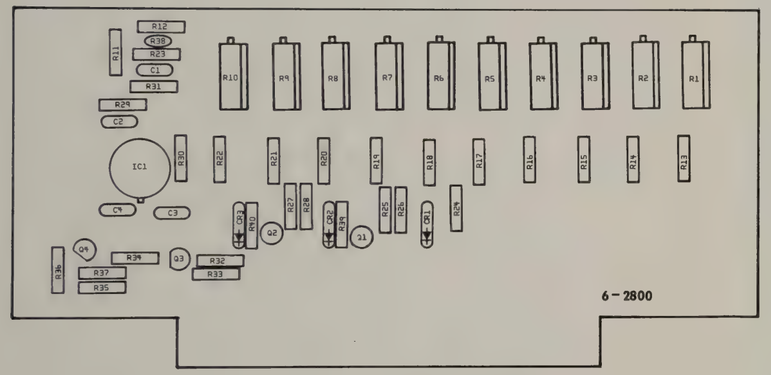
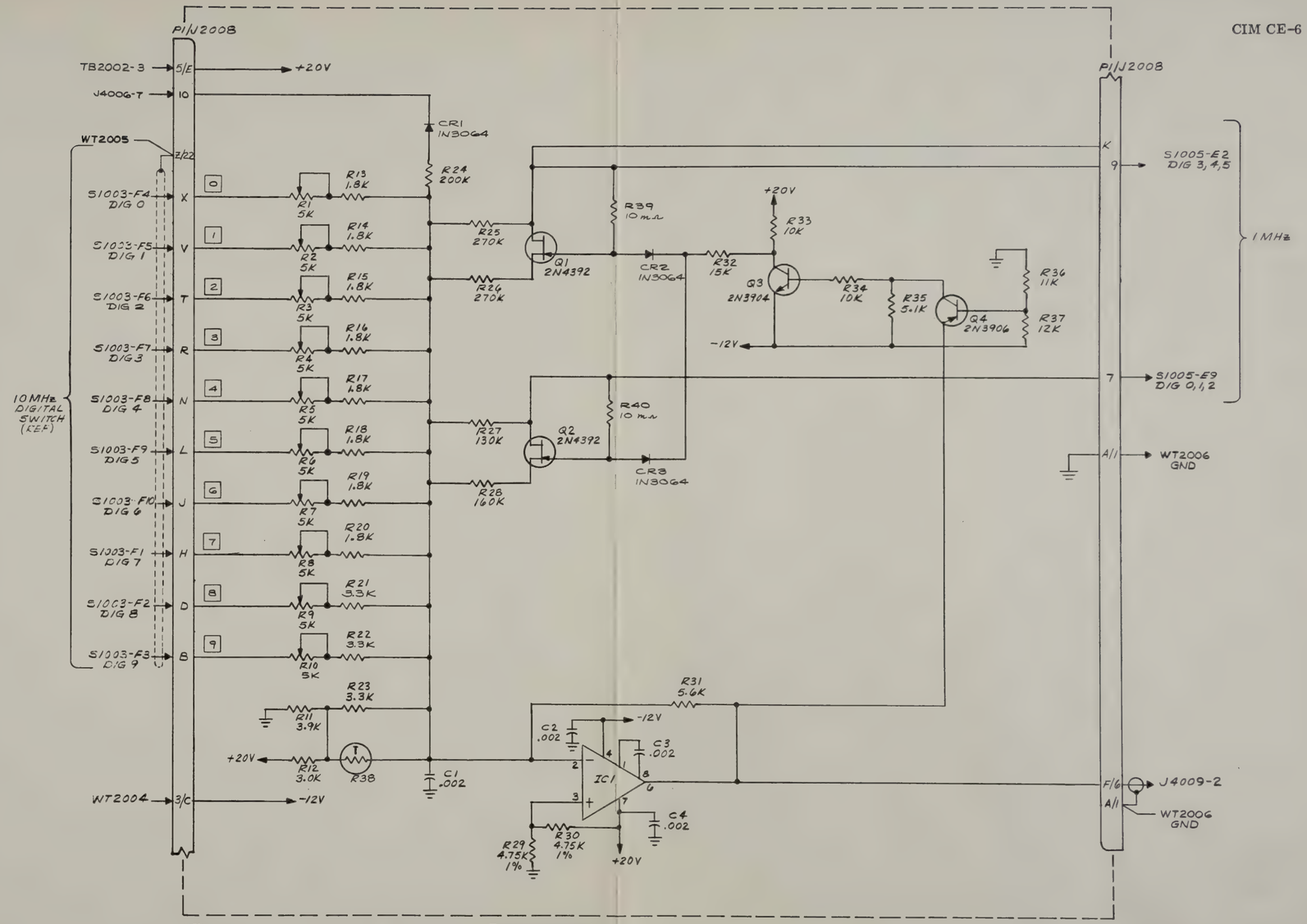


Figure 6-12. 1190 MHz - 1300 MHz Reference Voltage. 2800

1190 MHz - 1300 MHz REFERENCE VOLTAGE (cont). 2800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R36	Comp, 11k, ±5%, 1/4W	1066-1135	Allen-Bradley	CB1135
R37	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R38	Thermistor, 1k	1253-0002	Veco	31E2
R39	Comp, 10 Meg, ±5%, 1/4W	1066-1065	Allen-Bradley	CB1065
R40	Comp, 10 Meg, ±5%, 1/4W	1066-1065	Allen-Bradley	CB1065
	TRANSISTORS			
Q1	N-Channel FET, 2N4392	1272-0054	Motorola	2N4392
Q2	N-Channel FET, 2N4392	1272-0054	Motorola	2N4392
Q3	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q4	Si, PNP, 2N3906	1272-0037	Motorola	2N3906





NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

IC NO.	TYPE
1	LM301A

Figure 6-12. 1190 MHz - 1300 MHz Reference Voltage. 2800

MICROWAVE CASTING. 3000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3000	Microwave Casting	7046-0012	Cushman	
	CAPACITORS			
C1	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C2	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C3	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C4	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C5	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C6	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C7	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C8	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C9	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C10	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C11	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C12	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C13	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C14	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C15	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C16	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C17	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C18	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C19	Feed thru, 1000pF, 500V	1005-0083	Sprague	514C1
C20	Elect, 25μF, +75-10%, 25V	1013-0010	Sprague	30D256G025CB5
	COILS			
L1	RF Choke, .22μF, ±20%	1585-0039	Delevan	1537-02
L2	RF Choke, .22μF, ±20%	1585-0039	Delevan	1537-02
L3	RF Choke, .22μF, ±20%	1585-0039	Delevan	1537-02
L4	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L5	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L6	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L7	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L8	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L9	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L10	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L11	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L12	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L13	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L14	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L15	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L16	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L17	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L18	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L19	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L20	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L21	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L22	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L23	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L24	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L25	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B
L26	Choke, Ferrite Bead, U250	1586-0004	Ferroxcube	56-590-65/4B

MICROWAVE CASTING (cont). 3000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	CONNECTORS			
J1	P/O 3300			
J2	P/O 3200			
J3	P/O 3200			
J4	12 Contact, Double row	2535-0052	Masterite	2MC6D11-1
J5	P/O 3750			
J6	P/O 3900			
	DIODES			
CR1	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR2	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	RESISTORS			
R1	Comp, 2.4k, ±5%, 1/4W	1066-2425	Allen-Bradley	CB2425
R2	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725

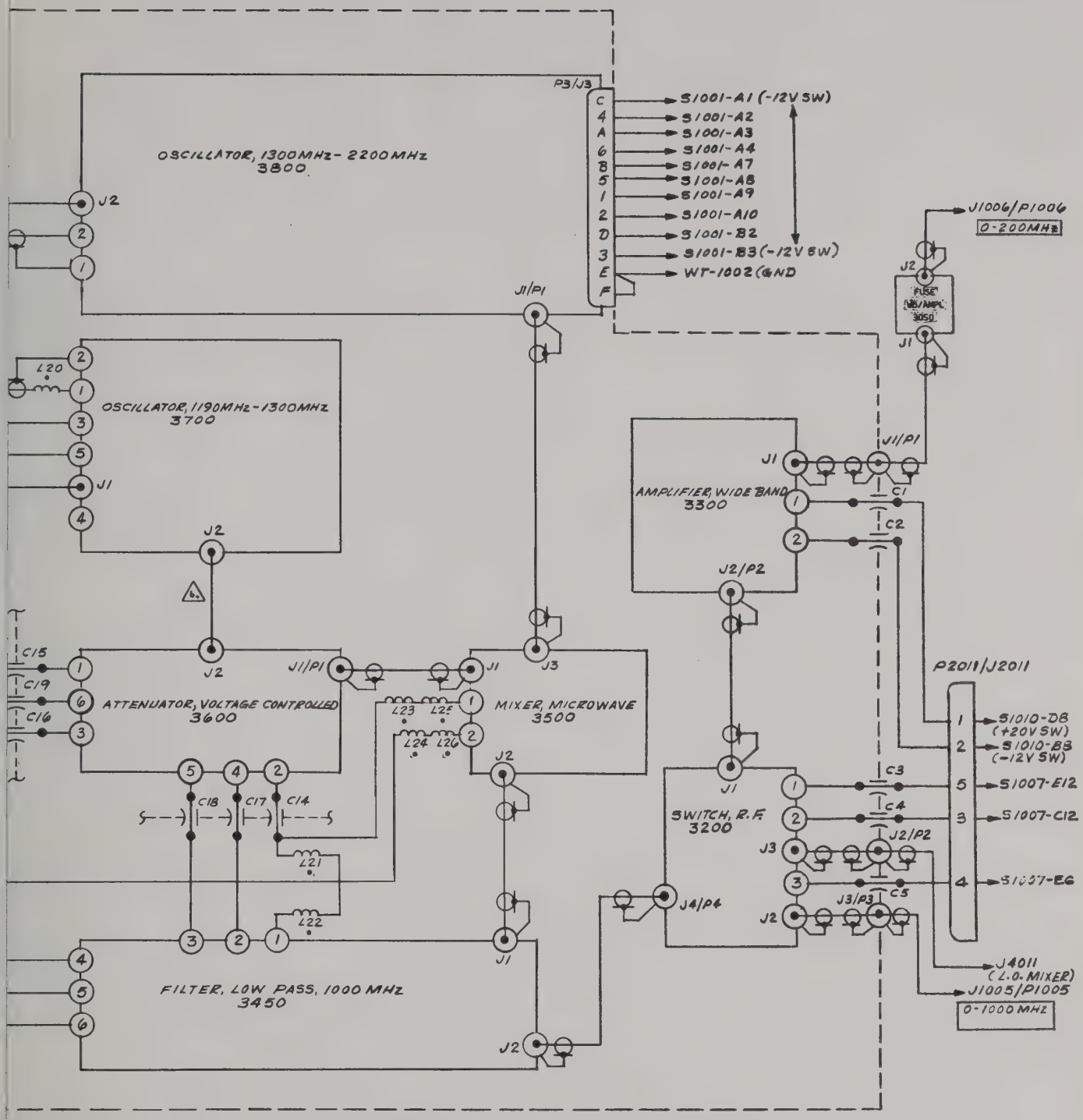
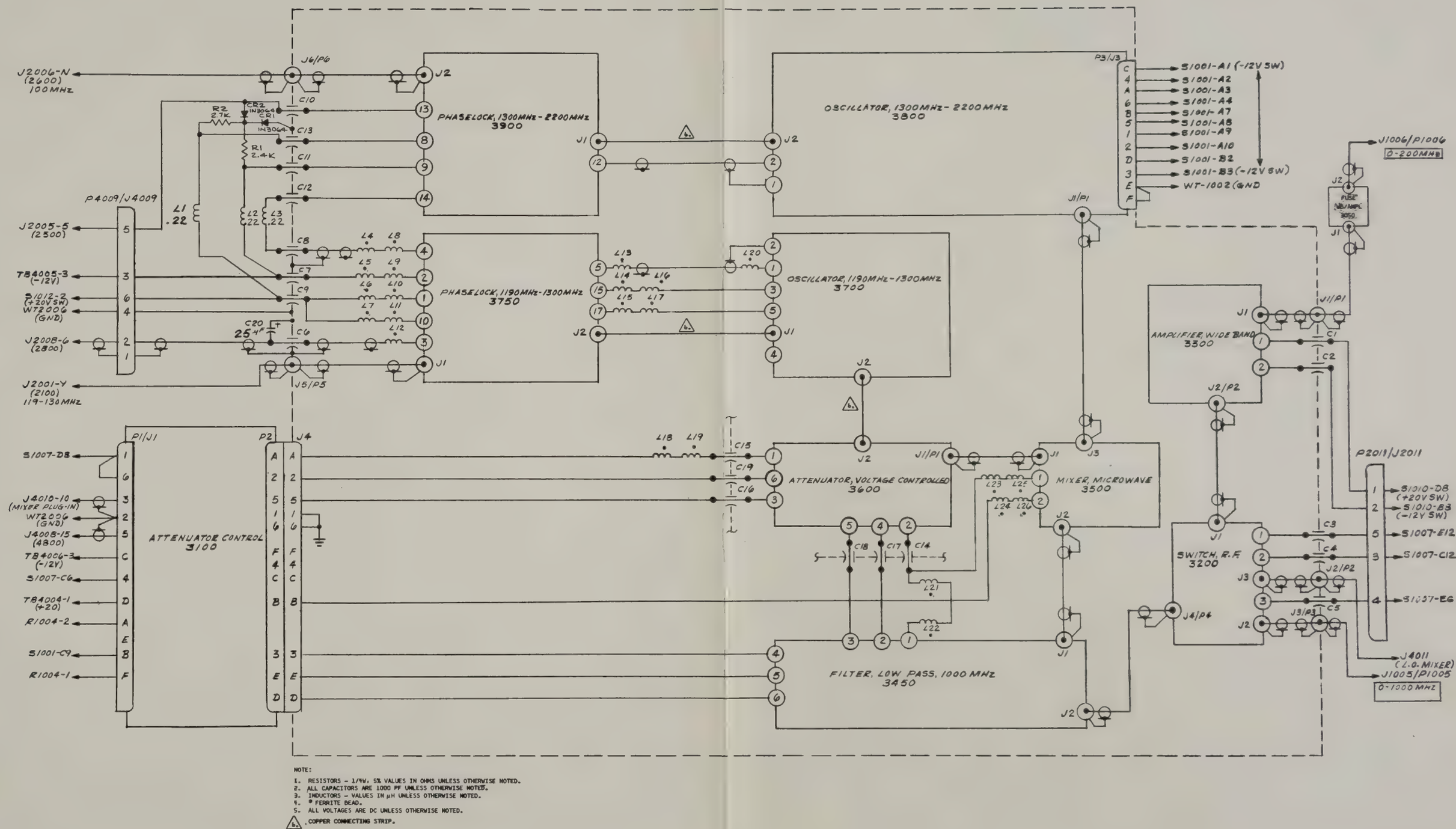


Figure 6-13. Microwave Casting Interconnection Diagram. 3000

6-55/6-56

MICROWAVE CASTING (cont). 3000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	CONNECTORS			
J1	P/O 3300			
J2	P/O 3200			
J3	P/O 3200			
J4	12 Contact, Double row	2535-0052	Masterite	2MC6D11-1
J5	P/O 3750			
J6	P/O 3900			
	DIODES			
CR1	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR2	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	RESISTORS			
R1	Comp, 2.4k, ±5%, 1/4W	1066-2425	Allen-Bradley	CB2425
R2	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725



NOTE:

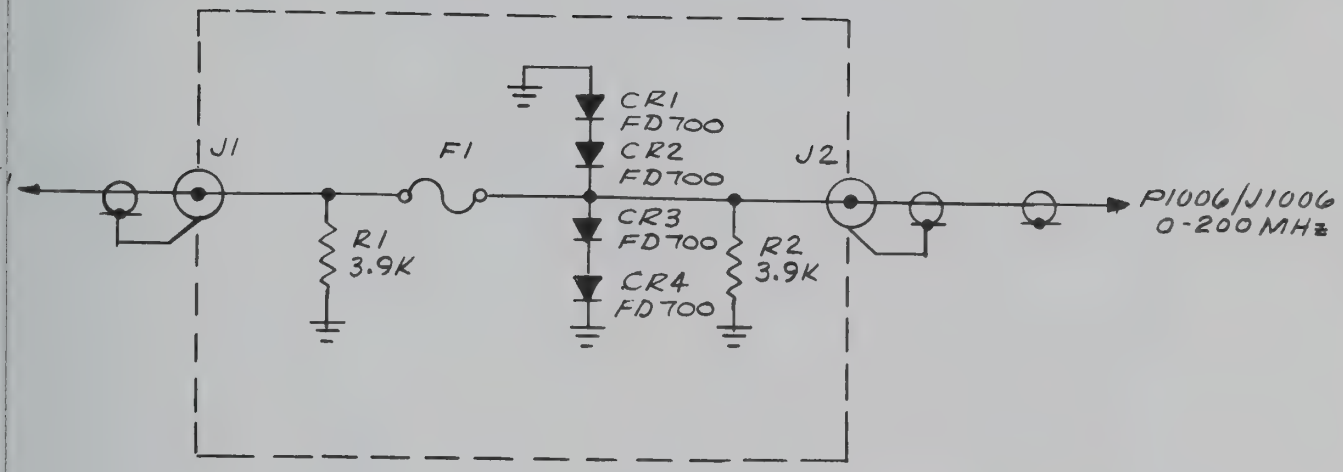
1. RESISTORS - 1/4W; 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS ARE 1000 PF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. ● FERRITE BEAD.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

△b. COPPER CONNECTING STRIP.

Figure 6-13. Microwave Casting Interconnection Diagram. 3000

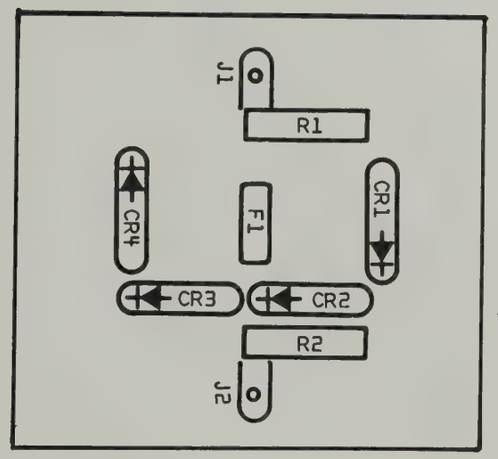
WIDE BAND AMPLIFIER FUSE ASSEMBLY. 3050

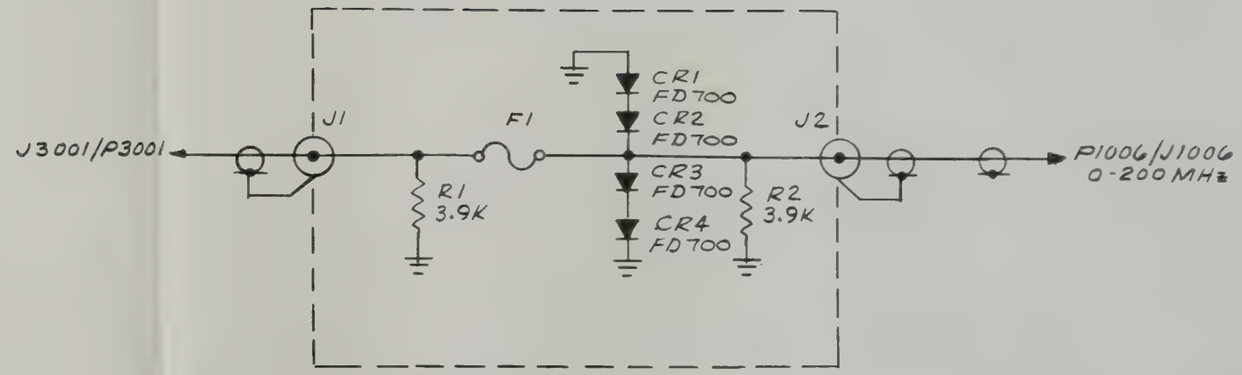
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3050	Wide Band Ampl			
	P.C. Board Assy	7001-0186	Cushman	
	P.C. Board	1780-0263	Cushman	
	CABLE ASSEMBLY			
	3" RG-188 Right Angle Plug to Ferrule	7032-0017-02	Cushman	
	15" RG-188 BNC Plug to Ferrule	7032-0019-01	Cushman	
	FUSES			
F1	1/8 amp AT 125V	1955-0019	Littlefuse	275.125
	DIODES			
CR1	Pico second computer	1281-0061	Fairchild	FD700
CR2	Pico second computer	1281-0061	Fairchild	FD700
CR3	Pico second computer	1281-0061	Fairchild	FD700
CR4	Pico second computer	1281-0061	Fairchild	FD700
	RESISTORS			
R1	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R2	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925



1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
VALUES IN μF UNLESS OTHERWISE NOTED.
VALUES IN μH UNLESS OTHERWISE NOTED.
ECT. TYPICAL VALUE SHOWN.
ARE DC UNLESS OTHERWISE NOTED.

Figure 6-14. Wide Band Amplifier Fuse Assembly. 3050





NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-14. Wide Band Amplifier Fuse Assembly. 3050

ATTENUATOR CONTROL. 3100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3100	Attenuator Control			
	P.C. Board Assy	7001-0151	Cushman	
	P.C. Board	1780-0269	Cushman	
	CAPACITORS			
C1	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C2	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C3	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C4	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C5	Mica, 10pF, ±5%, 500V	1002-0016	Elmenco	DM15-C-100J
C6	Mica, 2701F, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C7	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C8	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C9	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C10	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C11	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C12	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C13	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C14	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C15	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C16	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C19	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
	COILS			
L1	Choke, 22μH, ±20%, Molded	1585-0039	Delevan	1537-02
L2	Choke, 22μH, ±20%, Molded	1585-0039	Delevan	1537-02
L3	Choke, 22μH, ±20%, Molded	1585-0039	Delevan	1537-02
L4	Choke, 22μH, ±20%, Molded	1585-0039	Delevan	1537-02
L5	Choke, 22μH, ±20%, Molded	1585-0039	Delevan	1537-02
L6	Choke, 22μH, ±20%, Molded	1585-0039	Delevan	1537-02
	DIODES			
CR1	Diodes, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR2	Diodes, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR3	Diodes, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	INTEGRATED CIRCUITS			
IC1	Op Ampl, LM301A	2025-0032	National	LM301A
IC2	High Performance Op Ampl	2025-0022	T.I.	SN72741N
IC3	High Performance Op Ampl	2025-0022	T.I.	SN72741N
IC4	High Performance Op Ampl	2025-0022	T.I.	SN72741N
	RESISTORS			
R1	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R2	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R3	Pot, 10k, ±10%, .3W, 1/2" Cer	1215-0022	Weston	522-00HS-10K
R4	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R5	Not Used			

ATTENUATOR CONTROL (cont). 3100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R6	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R7	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R8	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R9	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R10	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R11	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R12	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R13	Comp, FSV, ±5%, 1/4W	1066-xxxx		
R14	Pot, 10k, ±10%, .3W, 1/2" Cer	1215-0022	Weston	522-00HS-10K
R15	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R16	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R17	Comp, 3.6k, ±5%, 1/4W	1066-3625	Allen-Bradley	CB3625
R18	Comp, 20k, ±5%, 1/4W	1066-2035	Allen-Bradley	CB2035
R19	Pot, 5k, ±10%, .3W, 1/2" Cer	1215-0020	Weston	522-00HS-5K
R20	Pot, 20k, ±10%, .3W, 1/2" Cer	1215-0024	Weston	522-00HS-20K
R21	Not Used			
R22	Metal Film, 18.2k, ±1%, 1/8W	1075-0075	Dale	MFF 1/8 T0
R23	Comp, 27k, ±5%, 1/4W	1066-2735	Allen-Bradley	CB2735
R24	Comp, 3.6k, ±5%, 1/4W	1066-3625	Allen-Bradley	CB3625
R25	Metal Film, 18.2k, ±1%, 1/8W	1075-0075	Dale	MFF 1/8 T0
R26	Metal Film, 36.5k, ±1%, 1/8W	1075-0113	Dale	MFF 1/8 T1
R27	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R28	Metal Film, 18.2k, ±1%, 1/8W	1075-0075	Dale	MFF 1/8 T0
R29	Pot, 100k, ±10%, .3W, 1/2" Cer	1215-0018	Weston	522-00HS-100K
R30	Comp, 56k, ±5%, 1/4W	1066-5635	Allen-Bradley	CB5635
R31	Pot, 10k, ±10%, .3W, 1/2" Cer	1215-0022	Weston	522-00HS-10K
R32	Comp, 16k, ±5%, 1/4W	1066-1635	Allen-Bradley	CB1635
R33	Comp, 13k, ±5%, 1/4W	1066-1335	Allen-Bradley	CB1335
R34	Comp, 16k, ±5%, 1/4W	1066-1635	Allen-Bradley	CB1635
R35	Metal Film, 20k, ±1%, 1/8W	1075-0096	Dale	MFF 1/8 T1
R36	Comp, 4.3k, ±5%, 1/4W	1066-4325	Allen-Bradley	CB4325
R37	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R38	Comp, 68Ω, ±5%, 1/4W	1066-6805	Allen-Bradley	CB6805
R39	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R40	Comp, 4.3k, ±5%, 1/4W	1066-4325	Allen-Bradley	CB4325
R41	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R42	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R43	Pot, 10k, ±10%, .3W, 1/2" Cer	1215-0022	Weston	522-00HS-10K
R44	Pot, 20k, ±10%, .3W, 1/2" Cer	1215-0024	Weston	522-00HS-20K
R45	Comp, FSV, ±5%, 1/4W	1066-xxxx		
R46	Pot, 5k, ±10%, .3W, 1/2" Cer	1215-0020	Weston	522-00HS-5K
R47	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R48	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R49	Pot, 5k, ±10%, .3W, 1/2" Cer	1215-0020	Weston	522-00HS-5K
R50	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R51	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R52	Comp, 16k, ±5%, 1/4W	1066-1635	Allen-Bradley	CB1635
R53	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R54	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R55	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035

ATTENUATOR CONTROL (cont). 3100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q2	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q3	Not Used			
Q4	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q5	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q6	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q7	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q8	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q9	NPN, 2N5962	1272-0059	Fairchild	2N5962
Q10	Not Used			
Q11	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q12	NPN, 2N5962	1272-0059	Fairchild	2N5962
Q13	Si, NPN, 2N3904	1272-0032	Motorola	2N3904

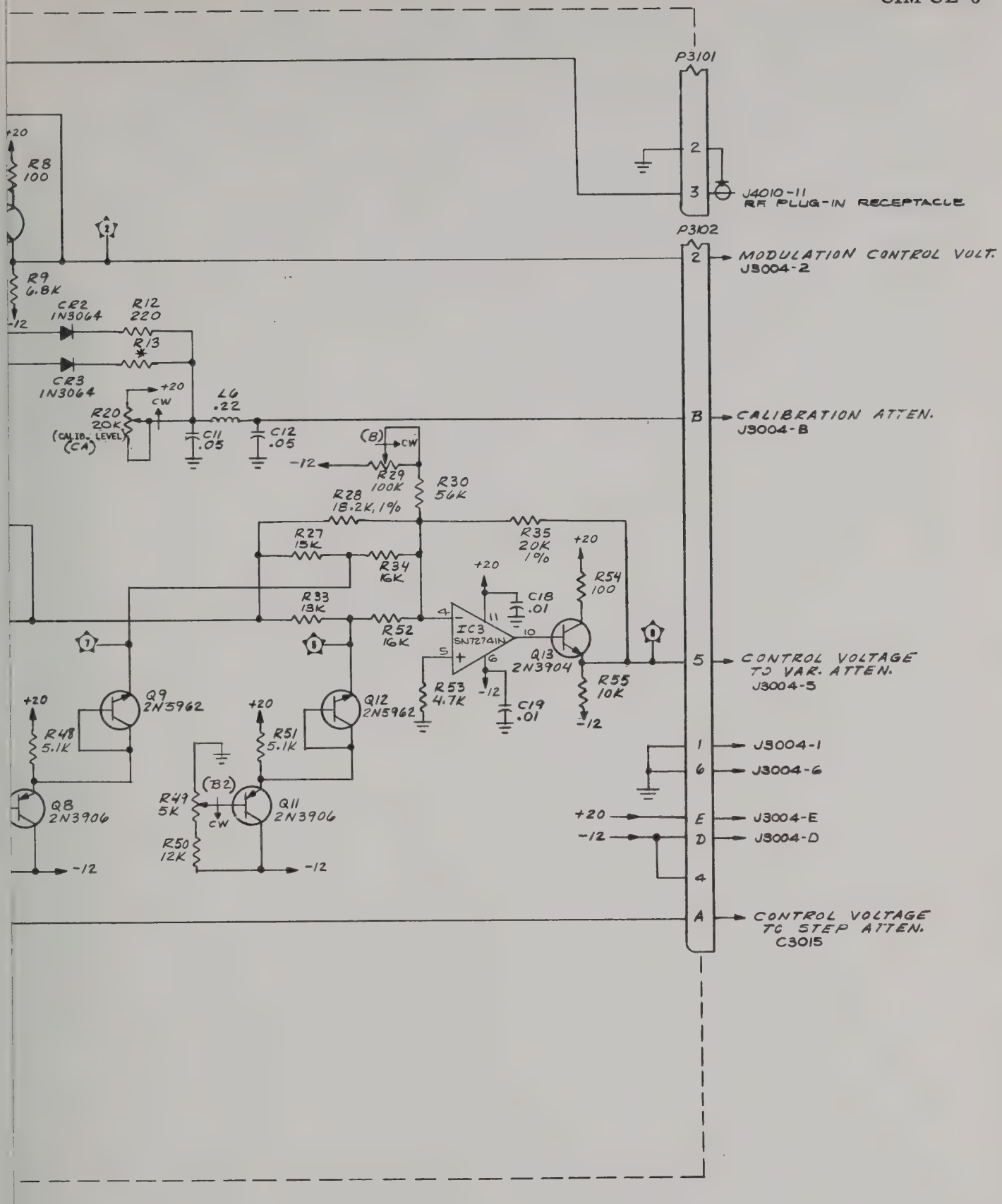
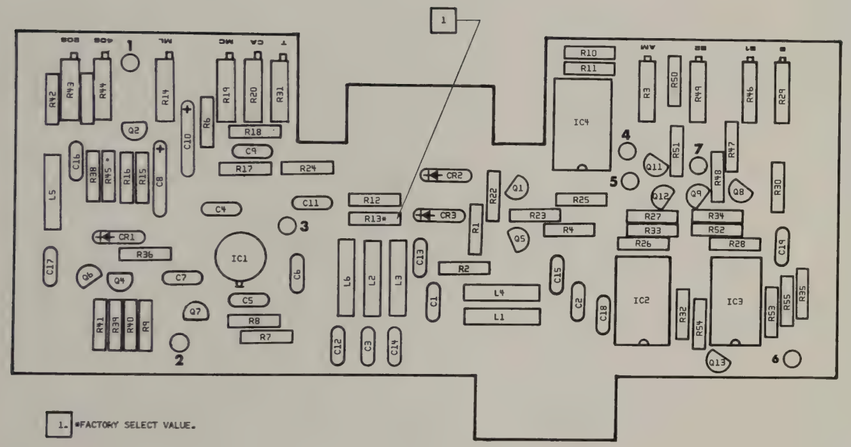
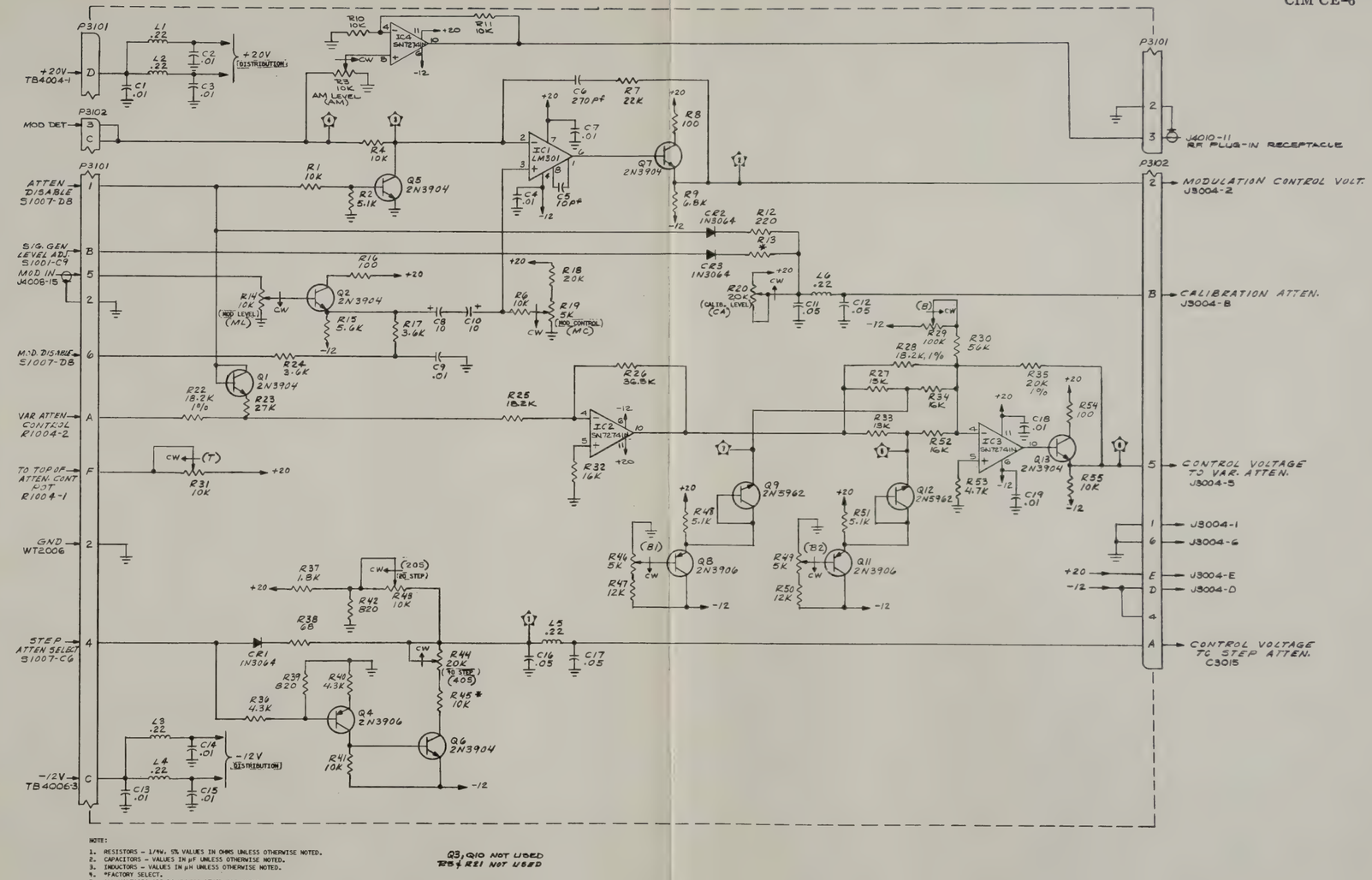


Figure 6-15. Attenuator Control. 3100



5601--0040

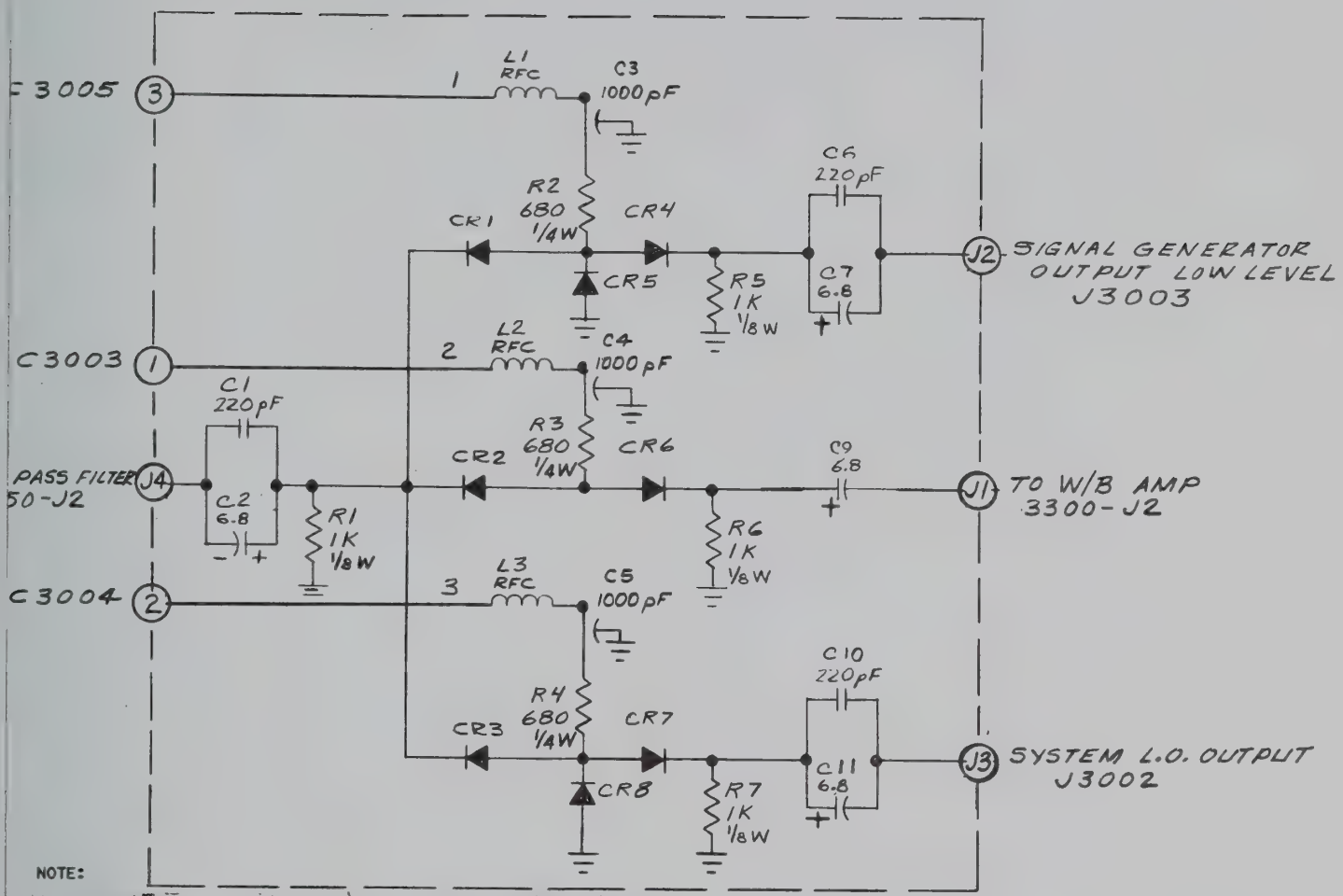


NOTE:
1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-15. Attenuator Control. 3100

R.F. SWITCH. 3200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3200	R.F. Switch			
	P.C. Board Assy	7001-0152	Cushman	
	P.C. Board	1780-0281	Cushman	
	CABLE ASSEMBLIES			
	Straight bulkhead	7032-0010-01	Cushman	
	Straight bulkhead	7032-0010-02	Cushman	
	Straight plug	7032-0018-02	Cushman	
	CAPACITORS			
C1	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C2	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C3	Feed thru, 1000pF, +100-0%	1005-0077	Allen-Bradley	FW5N
C4	Feed thru, 1000pF, +100-0%	1005-0077	Allen-Bradley	FW5N
C5	Feed thru, 1000pF, +100-0%	1005-0077	Allen-Bradley	FW5N
C6	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C7	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C8	Not Used			
C9	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C10	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C11	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
	COILS			
L1	Choke, Ferrite Bead, U-250	1586-0004	Ferroxcube	56-590-65/4B
L2	Choke, Ferrite Bead, U-250	1586-0004	Ferroxcube	56-590-65/4B
L3	Choke, Ferrite Bead, U-250	1586-0004	Ferroxcube	56-590-65/4B
	DIODES			
CR1	Si, Pin Switching	1281-0050	Motorola	MPN-3401
CR2	Si, Pin Switching	1281-0050	Motorola	MPN-3401
CR3	Si, Pin Switching	1281-0050	Motorola	MPN-3401
CR4	Si, Pin Switching	1281-0050	Motorola	MPN-3401
CR5	Si, Pin Switching	1281-0050	Motorola	MPN-3401
CR6	Si, Pin Switching	1281-0050	Motorola	MPN-3401
CR7	Si, Pin Switching	1281-0050	Motorola	MPN-3401
CR8	Si, Pin Switching	1281-0050	Motorola	MPN-3401
	JACKS			
J4	RF straight, subminiature	2536-0036	Cushman	
	RESISTORS			
R1	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R2	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R3	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R4	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R5	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R6	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R7	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025

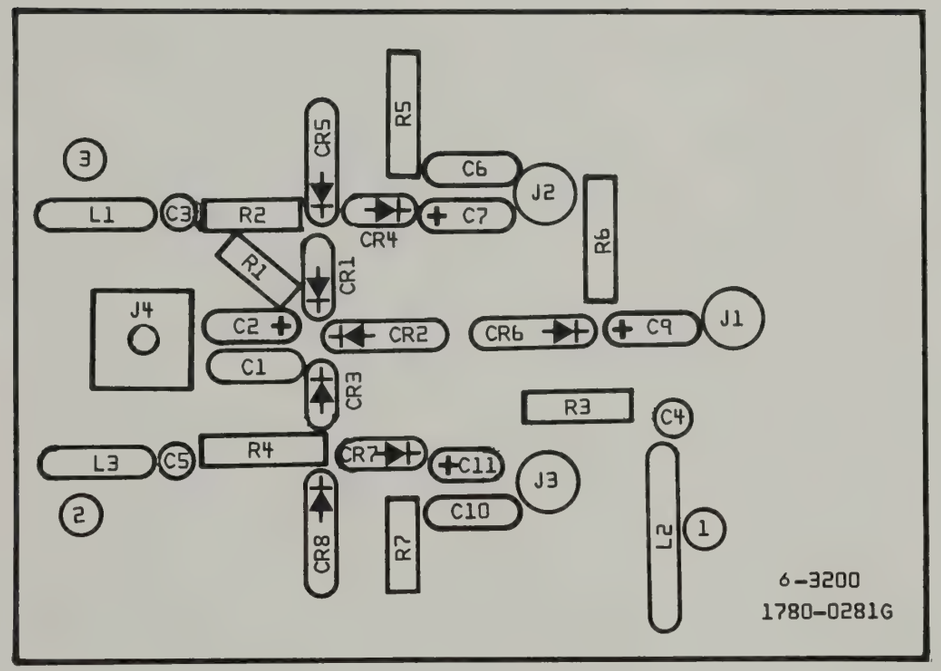


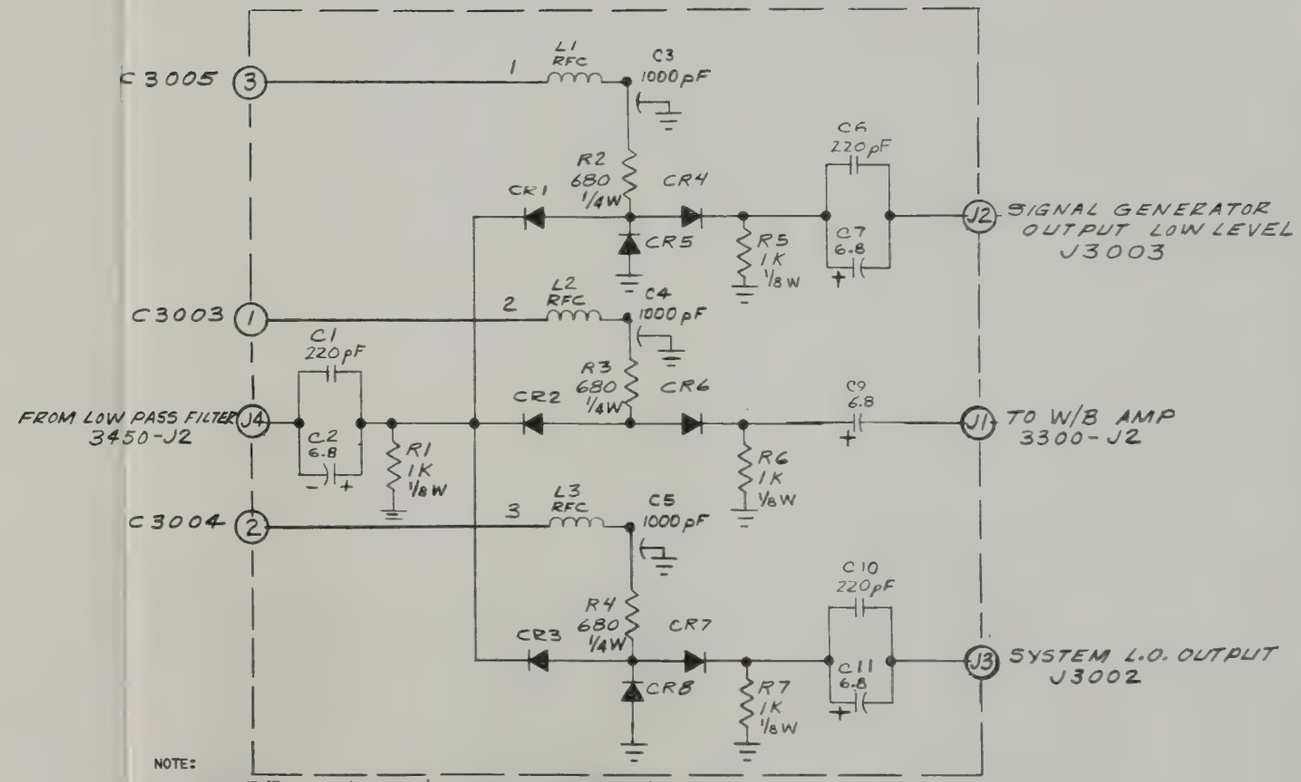
NOTE:

1. RESISTORS - 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. CHOKES FERRITE BEADS.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL DIODES MPN3401

C8 NOT USED

Figure 6-16. R. F. Switch. 3200





NOTE:

1. RESISTORS - 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN µF UNLESS OTHERWISE NOTED.
3. CHOKES FERRITE BEADS.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL DIODES MPN3401

C8 NOT USED

Figure 6-16. R. F. Switch. 3200

6-69/6-70

WIDEBAND AMPLIFIER. 3300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3300	Amplifier, Wideband			
	P.C. Board Assy	7001-0153	Cushman	
	P.C. Board	1780-0273	Cushman	
	CABLE ASSEMBLIES			
	Straight bulkhead jack	7032-0010-01	Cushman	
	CAPACITORS			
C1	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C2	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C3	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C4	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C5	Cer, 100pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C6	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C7	Chip, 12pF, ±5%, 50V	1012-0005	Varadyne	3BN050S220J(S)
C8	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C9	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C10	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C11	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C12	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C13	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C14	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C15	Cer, 100pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C16	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C17	Chip, 6.8pF, ±.5pF, 50V	1012-0012	Viclan	0805NP06T8D50S
C18	Chip, 12pF, ±5%, 50V	1012-0005	Varadyne	3BN050S220J(S)
C19	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C20	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C21	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C22	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C23	Tant Chip, 6.8μF, ±20%, 20V	1012-0001	Kemet	T411D685M020AU
C24	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C25	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C26	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C27	Elect, 15μF, ±10%, 25V	1013-0005	Sprague	30D156G025BB5
	COILS			
L1	Choke, .68μH, ±10%, Molded	1585-0024	Delevan	1537-08
L2	Coil, Air Core, 6 turns	1596-0077	Cushman	
L3	Choke, .68μH, ±10%, Molded	1585-0024	Delevan	1537-08
L4	Choke, .68μH, ±10%, Molded	1585-0024	Delevan	1537-08
L5	Coil, Toroid, 6 turn	1579-0032	Cushman	
L6	Coil, RF, .047μH	1596-0058-01	Cushman	
L7	Choke, .68μH, ±10%, Molded	1585-0024	Delevan	1537-08
L8	Choke, .68μH, ±10%, Molded	1585-0024	Delevan	1537-08
L9	Choke, .68μH, ±10%, Molded	1585-0024	Delevan	1537-08
	JACKS			
J2	Right Angle, subminiature	2536-0041	Sealectro	50-053-0000

WIDEBAND AMPLIFIER (cont). 3300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	RESISTORS			
R1	Comp, 110Ω, ±5%, 1/8W	1065-1115	Allen-Bradley	BB1115
R2	Comp, 18k, ±5%, 1/8W	1065-1835	Allen-Bradley	BB1835
R3	Comp, 8.2k, ±5%, 1/8W	1065-8225	Allen-Bradley	BB8225
R4	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R5	Comp, 110Ω, ±5%, 1/8W	1065-1115	Allen-Bradley	BB1115
R6	Comp, 18k, ±5%, 1/8W	1065-1835	Allen-Bradley	BB1835
R7	Comp, 8.2k, ±5%, 1/8W	1065-8225	Allen-Bradley	BB8225
R8	Comp, 820Ω, ±5%, 1/8W	1065-8215	Allen-Bradley	BB8215
R9	Comp, 100Ω, ±5%, 1/8W	1065-1015	Allen-Bradley	BB1015
R10	Comp, 270Ω, ±5%, 1/8W	1065-2715	Allen-Bradley	BB2715
R11	Comp, 100Ω, ±5%, 1/8W	1065-1015	Allen-Bradley	BB1015
R12	WW, 220Ω, ±3%, 1.5W	1177-0007	Dale	G-2
R13	WW, 300Ω, ±3%, 1.5W	1177-0008	Dale	G-2
	TRANSISTORS			
Q1	Si, NPN, 2N5179	1272-0067	RCA	2N5179
Q2	Si, NPN, 2N5179	1272-0067	RCA	2N5179
Q3	Si, NPN, A210	1272-0064	Amperex	A210

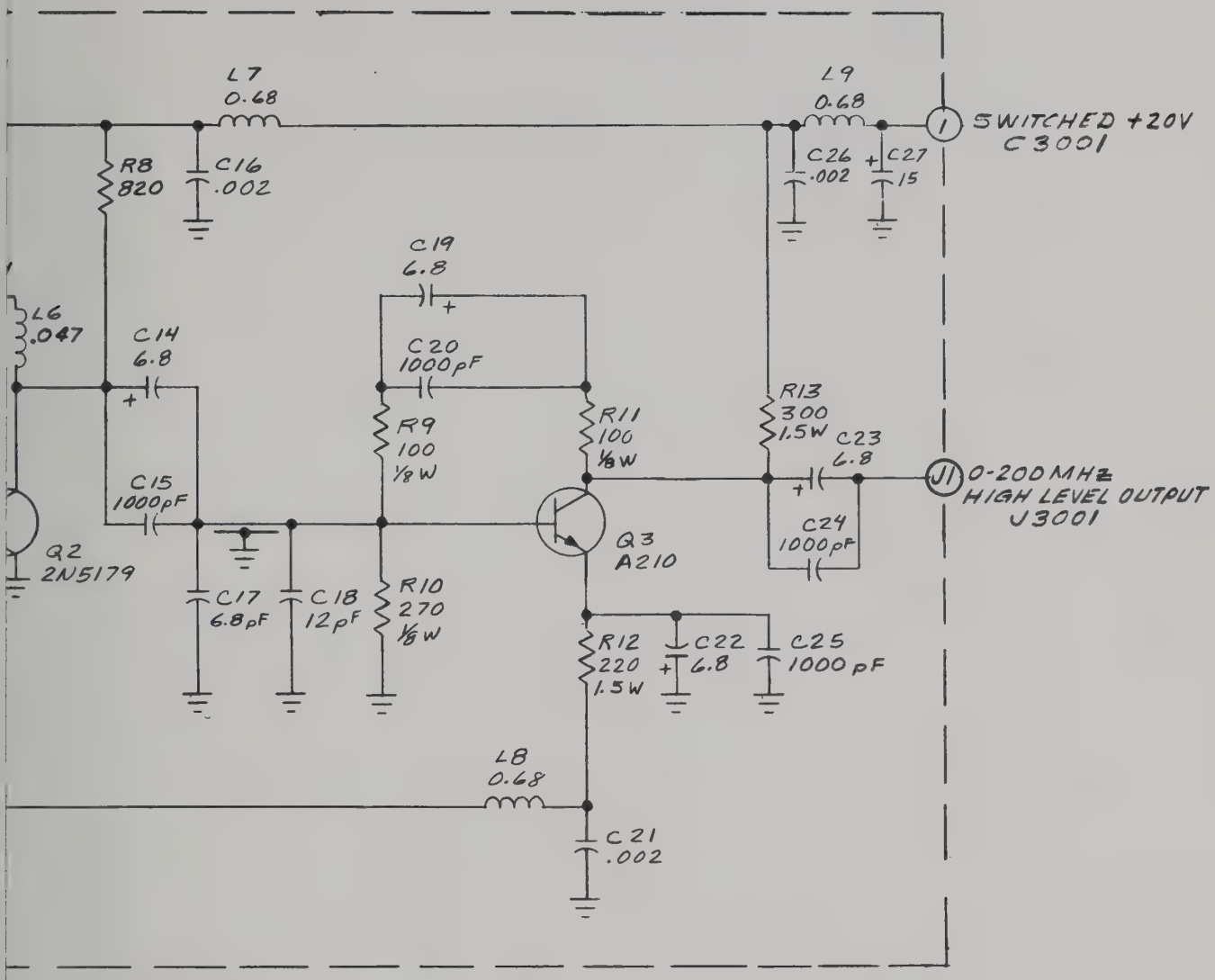
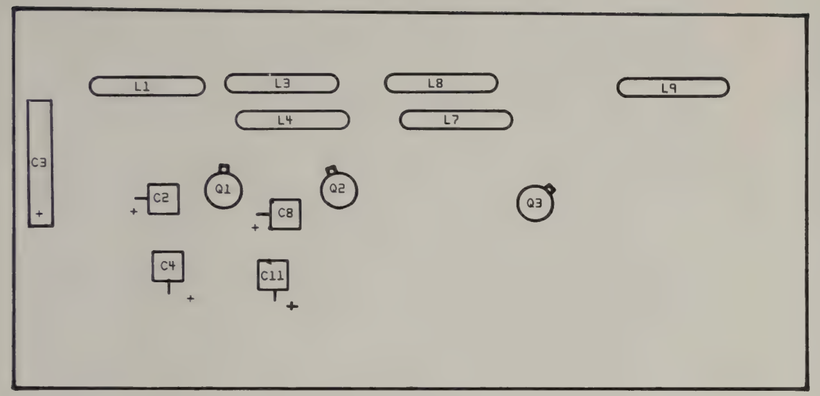


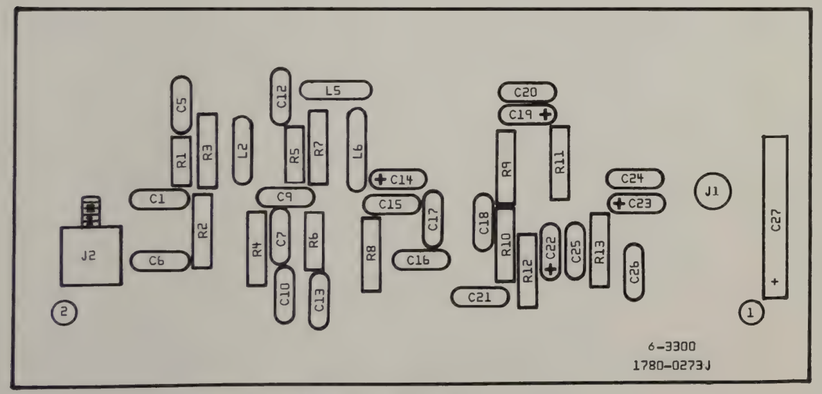
Figure 6-17. Wideband Amplifier. 3300

WIDEBAND AMPLIFIER (cont). 3300

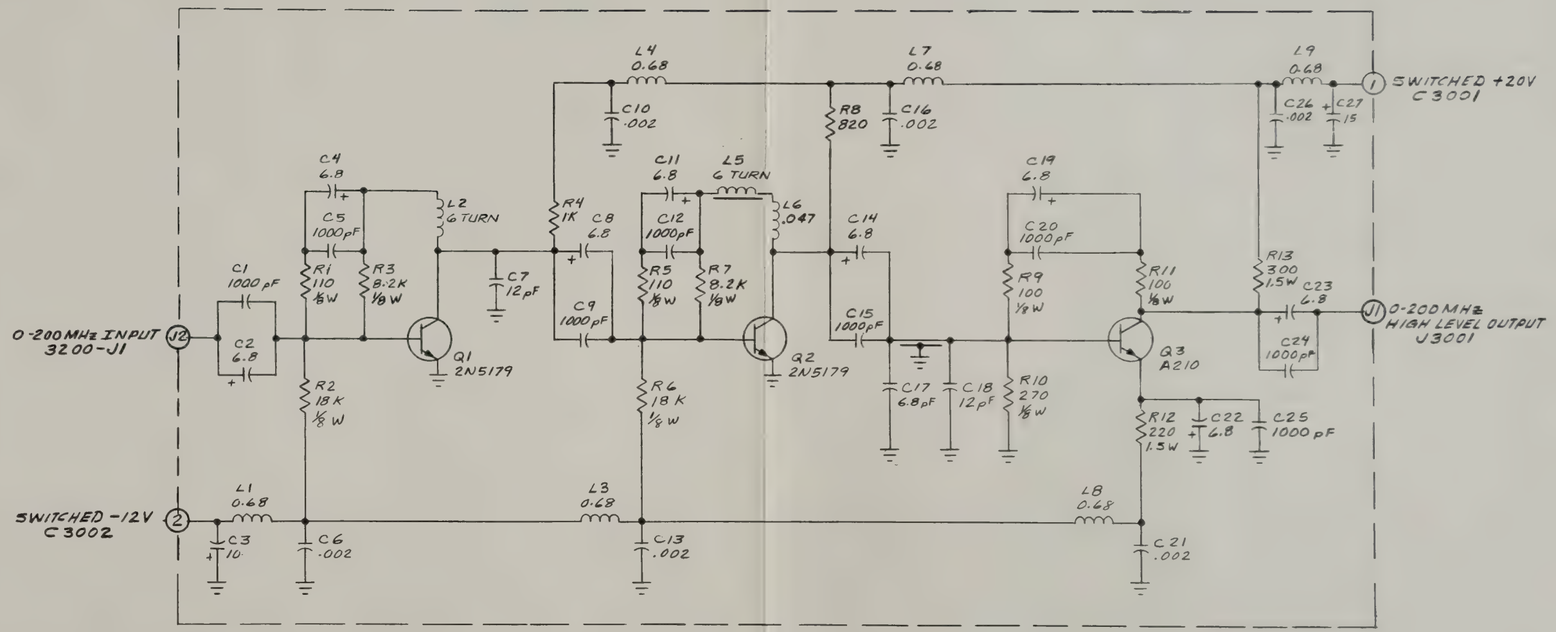
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	RESISTORS			
R1	Comp, 110Ω, ±5%, 1/8W	1065-1115	Allen-Bradley	BB1115
R2	Comp, 18k, ±5%, 1/8W	1065-1835	Allen-Bradley	BB1835
R3	Comp, 8.2k, ±5%, 1/8W	1065-8225	Allen-Bradley	BB8225
R4	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R5	Comp, 110Ω, ±5%, 1/8W	1065-1115	Allen-Bradley	BB1115
R6	Comp, 18k, ±5%, 1/8W	1065-1835	Allen-Bradley	BB1835
R7	Comp, 8.2k, ±5%, 1/8W	1065-8225	Allen-Bradley	BB8225
R8	Comp, 820Ω, ±5%, 1/8W	1065-8215	Allen-Bradley	BB8215
R9	Comp, 100Ω, ±5%, 1/8W	1065-1015	Allen-Bradley	BB1015
R10	Comp, 270Ω, ±5%, 1/8W	1065-2715	Allen-Bradley	BB2715
R11	Comp, 100Ω, ±5%, 1/8W	1065-1015	Allen-Bradley	BB1015
R12	WW, 220Ω, ±3%, 1.5W	1177-0007	Dale	G-2
R13	WW, 300Ω, ±3%, 1.5W	1177-0008	Dale	G-2
	TRANSISTORS			
Q1	Si, NPN, 2N5179	1272-0067	RCA	2N5179
Q2	Si, NPN, 2N5179	1272-0067	RCA	2N5179
Q3	Si, NPN, A210	1272-0064	Amperex	A210



BACK SIDE VIEW



FRONT SIDE VIEW



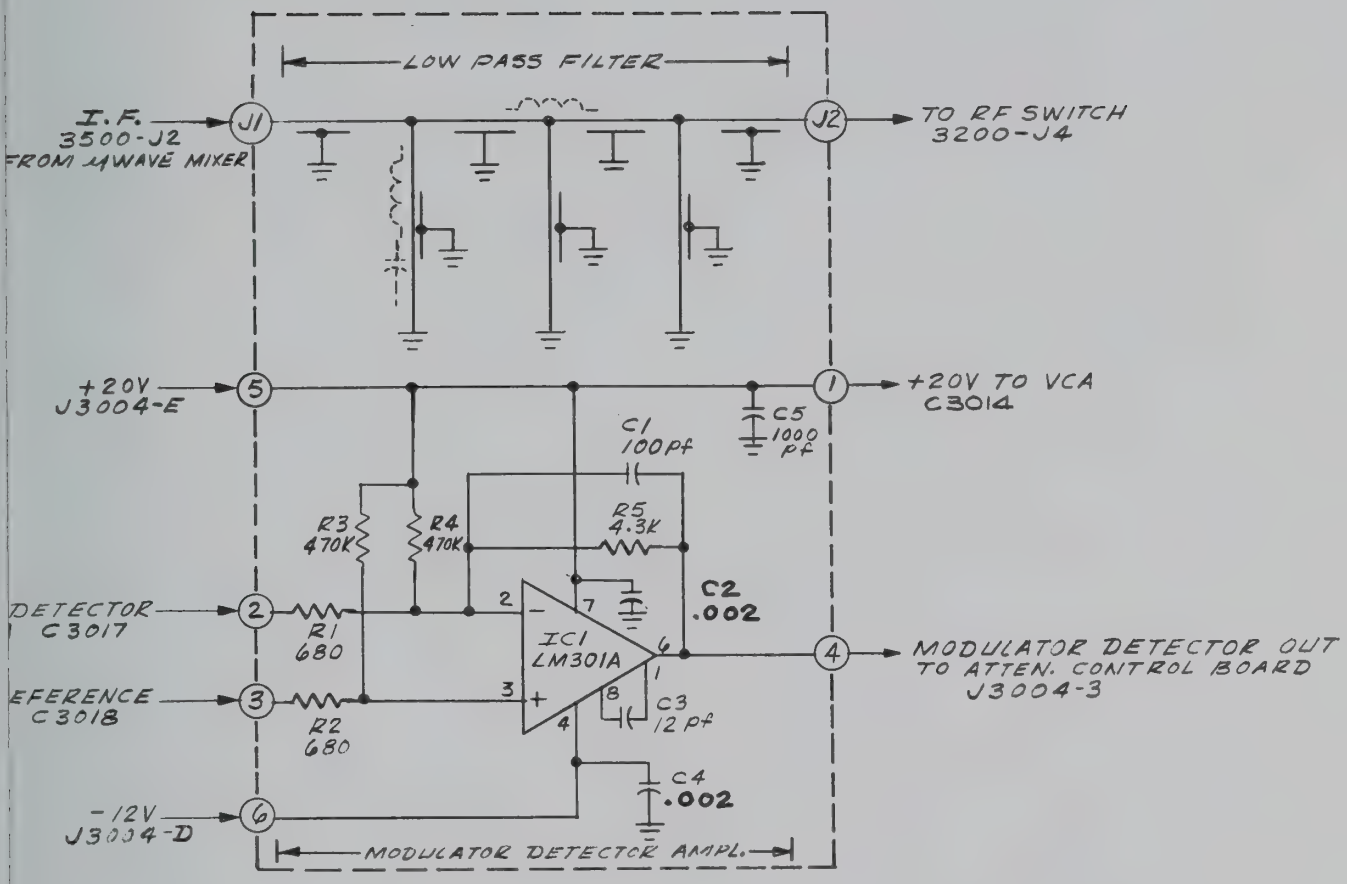
NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-17. Wideband Amplifier. 3300

1000 MHz LOW PASS FILTER. 3450

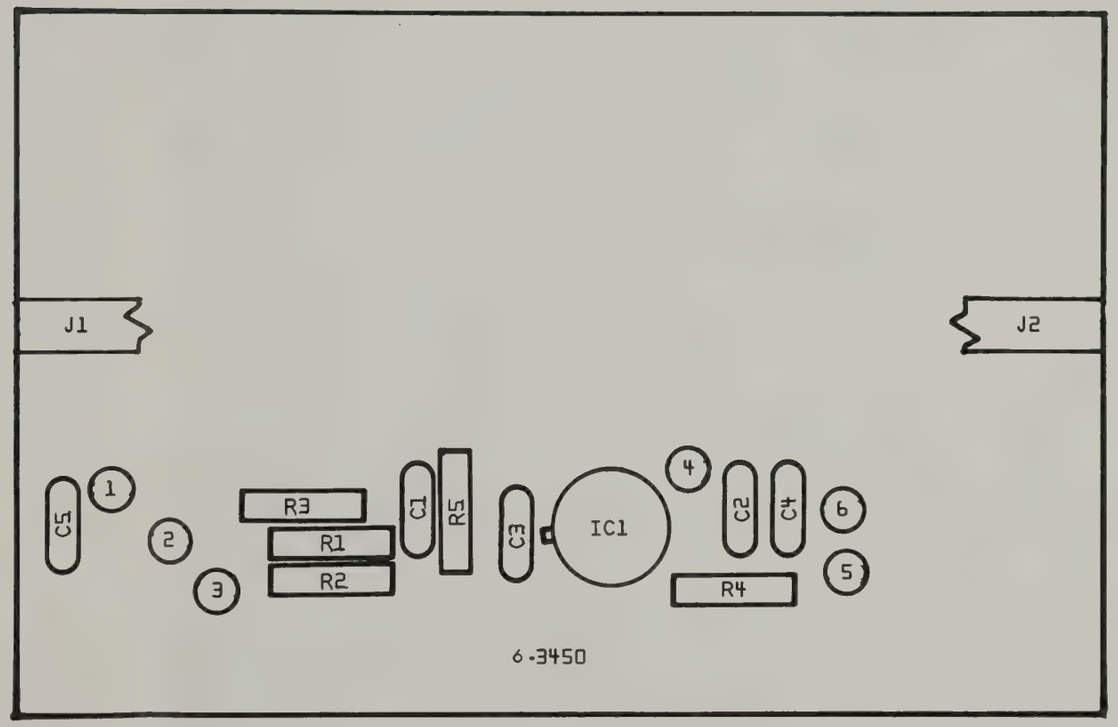
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3450	Filter, Low-Pass, 1000 MHz			
	P.C. Board Assy	7001-0154	Cushman	
	P.C. Board	1780-0312	Cushman	
	CABLE ASSEMBLIES			
	Right Angle Plug	7032-0017-01	Cushman	
	CAPACITORS			
C1	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C2	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C3	Mica, 12pF, ±5%, 500V	1002-0017	Elmenco	DM15-C-120J
C4	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C5	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
	INTEGRATED CIRCUITS			
IC1	Op Ampl, LM301A	2025-0032	National	LM301A
	RESISTORS			
R1	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R2	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R3	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R4	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R5	Comp, 4.3k, ±5%, 1/4W	1066-4325	Allen-Bradley	CB4325

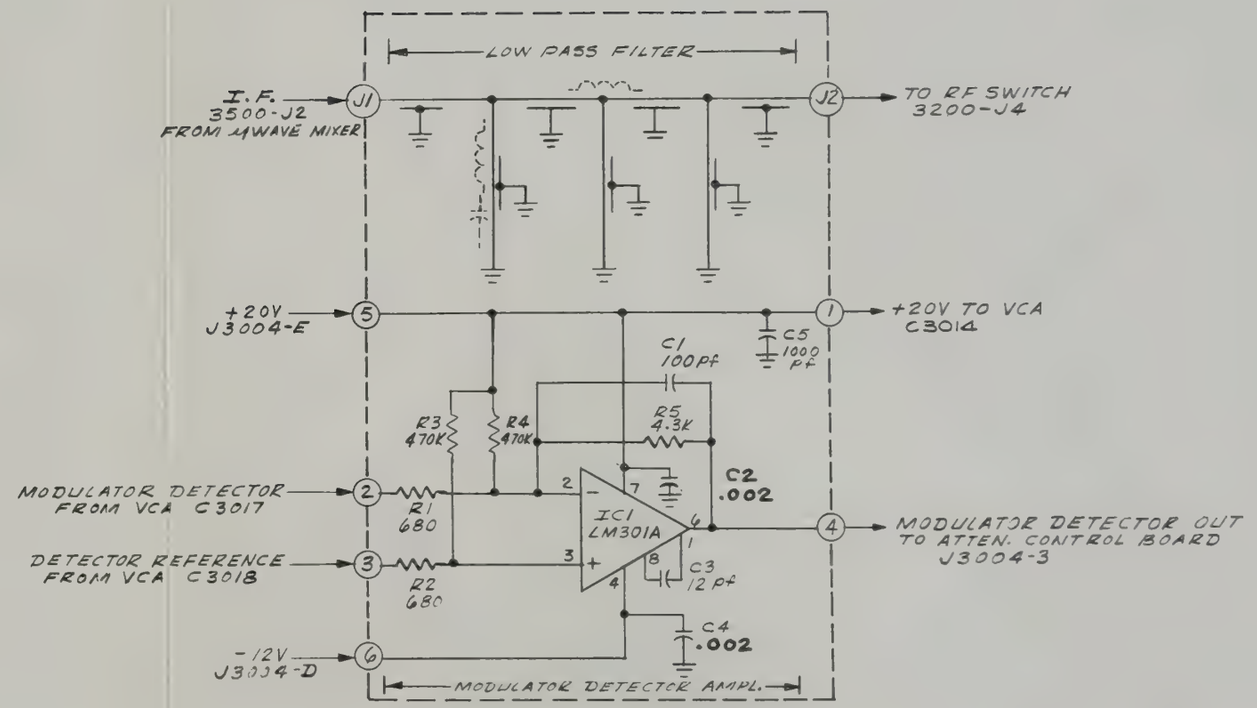


NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-18. 1000 MHz Low Pass Filter. 3450





NOTE:

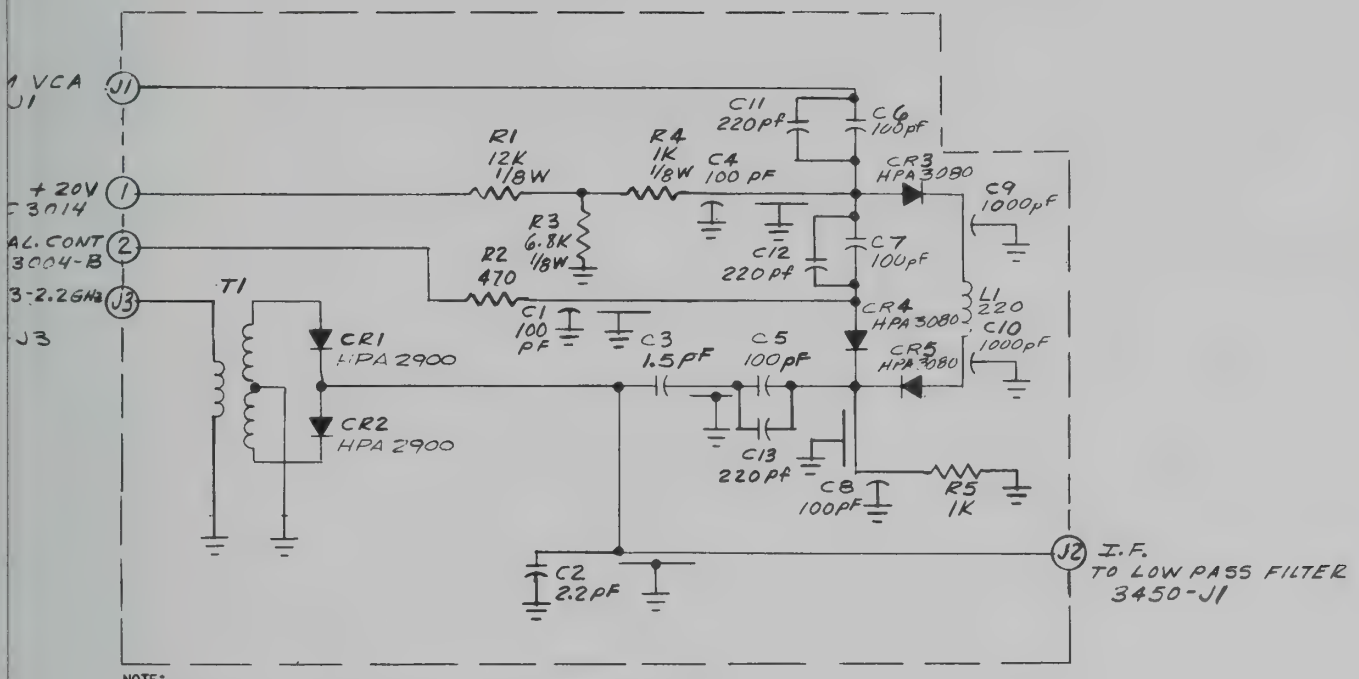
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-18. 1000 MHz Low Pass Filter. 3450

6-77/6-78

MICROWAVE MIXER. 3500

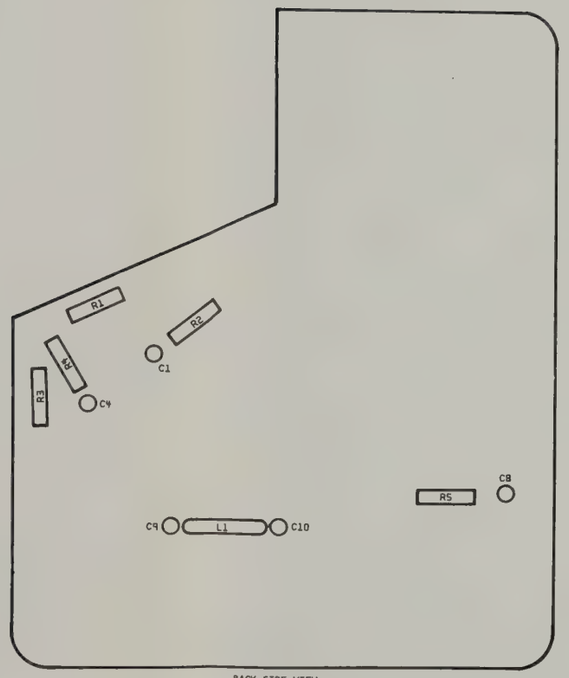
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3500	Mixer, Microwave			
	P.C. Board Assy	7001-0155	Cushman	
	P.C. Board	1780-0283	Cushman	
	CABLE ASSEMBLIES			
	Straight Plug	7032-0018-02	Cushman	
	CAPACITORS			
C1	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C2	Chip, 2.2pF, ±.25pF, 50V	1012-0003	Varadyne	3BN050S2R2C(S)
C3	Chip, 1.5pF, ±.25pF, 50V	1012-0002	Varadyne	3BN050S1R5C(S)
C4	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C5	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S101K(S)
C6	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S101K(S)
C7	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S101K(S)
C8	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C9	Feed thru, 1000pF, +100-0%, 300V	1005-0077	Allen-Bradley	FW5N
C10	Feed thru, 1000pF, +100-0%, 300V	1005-0077	Allen-Bradley	FW5N
C11	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C12	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C13	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
	COIL			
L1	Choke, 220μH, ±5%	1585-0018	Delevan	1537-92
	DIODES			
CR1	Diode, HPA 2900	1283-0003	HPA	HPA 2900
CR2	Diode, HPA 2900	1283-0003	HPA	HPA 2900
CR3	Silicon Pin, HPA 3080	1281-0055	HPA	HPA 3080
CR4	Silicon Pin, HPA 3080	1281-0055	HPA	HPA 3080
CR5	Silicon Pin, HPA 3080	1281-0055	HPA	HPA 3080
	RESISTORS			
R1	Comp, 12k, ±5%, 1/8W	1065-1235	Allen-Bradley	BB1235
R2	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R3	Comp, 6.8k, ±5%, 1/8W	1065-6825	Allen-Bradley	BB6825
R4	Comp, 1k, ±5%, 1/8W	1065-1025	Allen-Bradley	BB1025
R5	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
	TRANSFORMER			
T1	Toroidal Bifilar	1579-0026	Cushman	



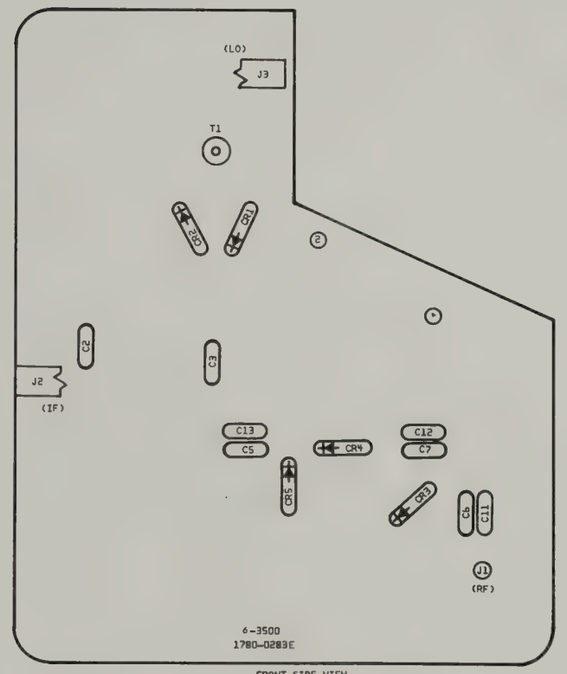
NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

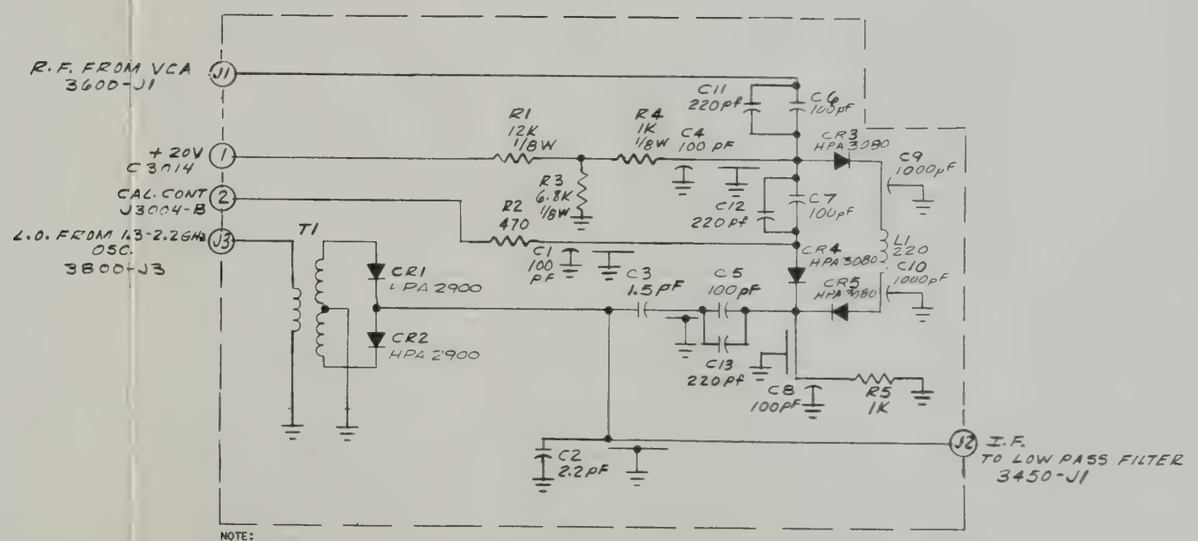
Figure 6-19. Microwave Mixer. 3500



BACK SIDE VIEW



FRONT SIDE VIEW



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-19. Microwave Mixer. 3500

VOLTAGE CONTROLLED ATTENUATOR. 3600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3600	Attenuator, Voltage Controlled			
	P.C. Board Assy	7001-0156	Cushman	
	P.C. Board	1780-0275	Cushman	
	CAPACITORS			
C1	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S10 1K (S)
C2	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C3	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C4	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C5	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S10 1K (S)
C6	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C7	Chip, 4.7pF, ±.25pF, 50V	1012-0009	Varadyne	3BN050S4R7C (S)
C8	Var, 1.3pF, -5.4pF	1000-0012	E.F.Johnson	187-0103-005
C9	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C10	Var, 1.3pF, -5.4pF	1000-0012	E.F.Johnson	187-0103-005
C11	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C12	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C13	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C14	Cer, 200pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C15	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S10 1K (S)
C16	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C17	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C18	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S10 1K (S)
C19	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C20	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C21	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C22	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S10 1K (S)
C23	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C24	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C25	Feed thru, 1000pF, +100-0%, GMV	1005-0077	Allen-Bradley	FW5N
C26	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C27	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S10 1K (S)
C28	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C29	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C30	Cer, 10pF, ±10%, 100V	1005-0074	Erie	8101-100-C0G-100K
	COILS			
L1	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L2	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L3	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L4	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L5	Coil, 1/2 turn, .004μH	1596-0063-01	Cushman	
L6	Coil, 1/2 turn, .004μH	1596-0063-01	Cushman	
L7	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L8	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L9	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L10	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L11	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L12	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L13	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L14	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L15	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B

VOLTAGE CONTROLLED ATTENUATOR (cont). 3600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
L16	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L17	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
	DIODES			
CR1	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR2	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR3	Silicon Hot Carrier, HPA-2811	1283-0004	HPA	HPA-2811
CR4	Silicon Hot Carrier, HPA-2811	1283-0004	HPA	HPA-2811
CR5	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR6	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR7	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR8	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR9	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR10	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR11	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR12	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR13	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
	JACKS			
J1	Right angle, sub-miniature	2536-0041	Cushman	
	RESISTORS			
R1	Comp, 47Ω, ±5%, 1/4W	1066-4705	Allen-Bradley	CB4705
R2	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R3	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Pot, 20k, ±20%, 1/2W, 4 turn	1203-0055	Bourns	3339H-1-203
R6	Comp, 47Ω, ±5%, 1/4W	1066-4705	Allen-Bradley	CB4705
R7	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R8	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R9	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R10	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R11	Pot, 5k, ±20%, 1/2W, 4 turn	1203-0054	Bourns	3339H-1-502
R12	Comp, 750Ω, ±5%, 1/4W	1066-7515	Allen-Bradley	CB7515
R13	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R14	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R15	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R16	Comp, 100Ω, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R17	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R18	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R19	Pot, 20k, ±20%, 1/2W, 4 turn	1203-0055	Bourns	3339H-1-203
R20	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R21	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R22	Comp, 390Ω, ±5%, 1/4W	1066-3915	Allen-Bradley	CB3915
R23	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R24	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
	TRANSISTORS			
Q1	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q2	Si, NPN, 2N3904	1272-0032	Motorola	2N3904

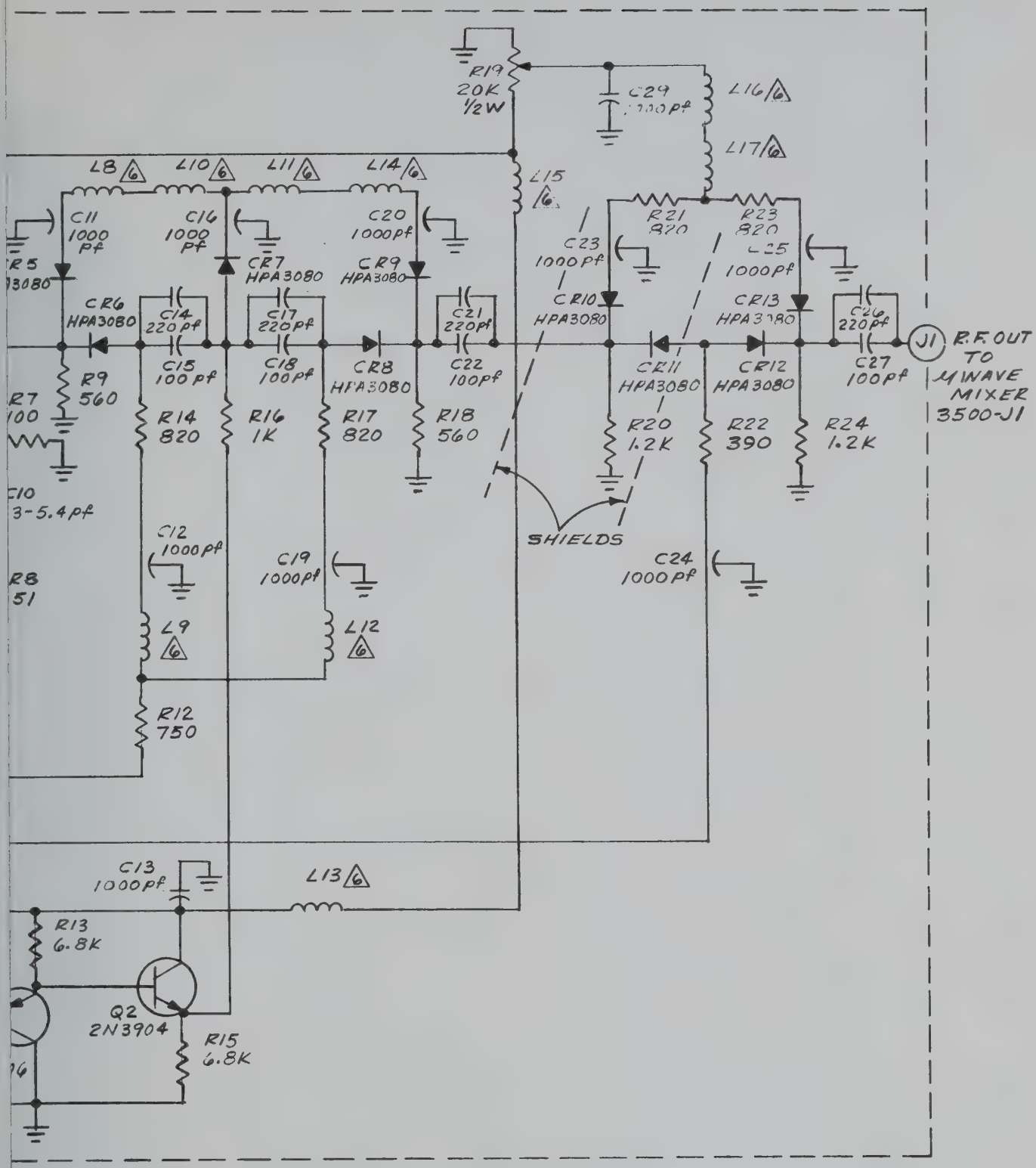
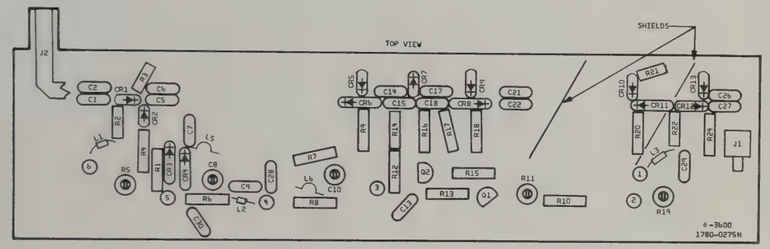
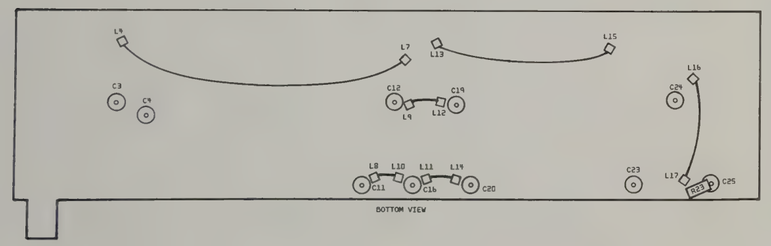


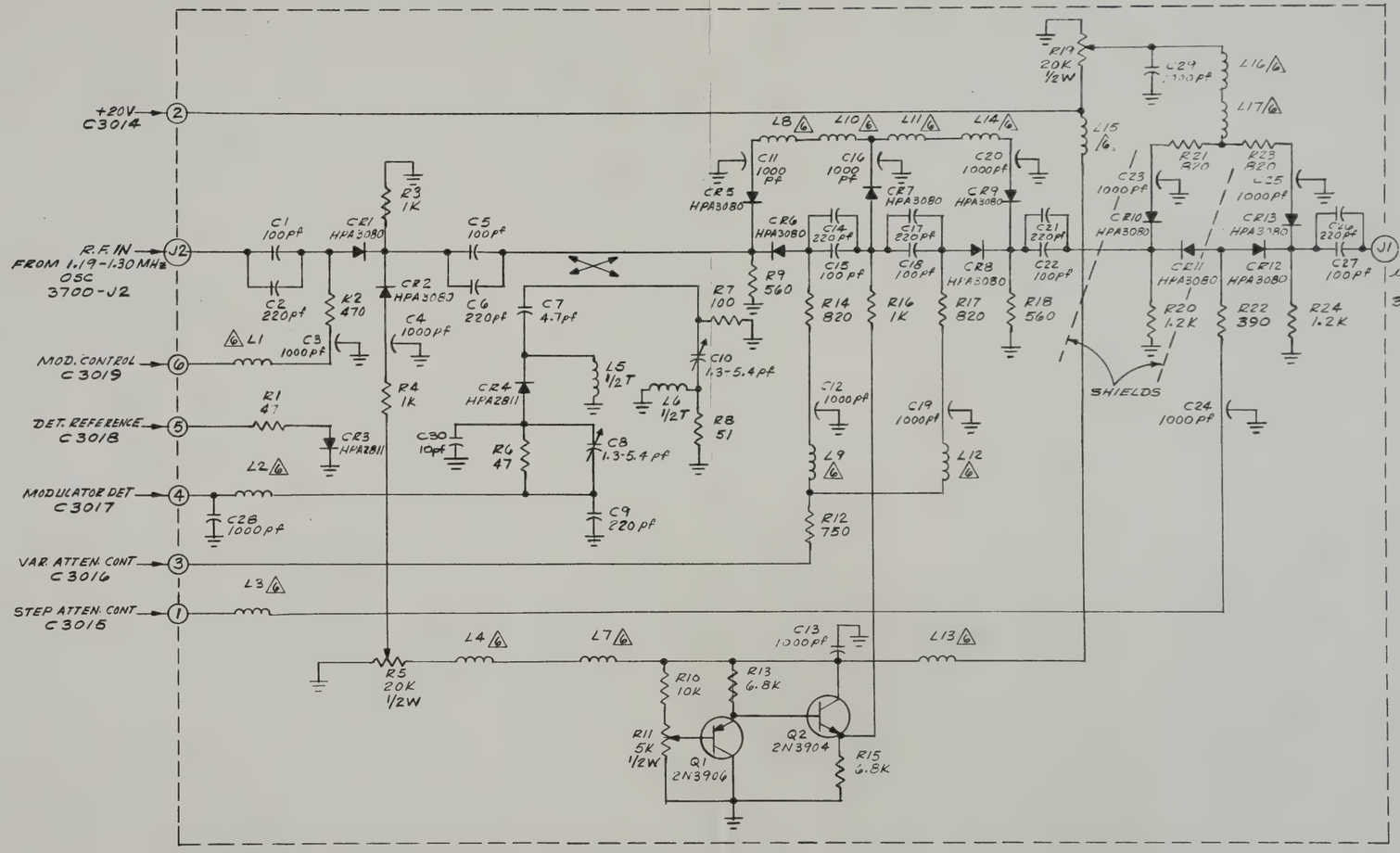
Figure 6-20. Voltage Controlled Attenuator. 3600

VOLTAGE CONTROLLED ATTENUATOR (cont). 3600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
L16	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
L17	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
	DIODES			
CR1	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR2	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR3	Silicon Hot Carrier, HPA-2811	1283-0004	HPA	HPA-2811
CR4	Silicon Hot Carrier, HPA-2811	1283-0004	HPA	HPA-2811
CR5	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR6	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR7	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR8	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR9	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR10	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR11	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR12	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
CR13	Silicon Pin, HPA-3080	1281-0055	HPA	HPA-3080
	JACKS			
J1	Right angle, sub-miniature	2536-0041	Cushman	
	RESISTORS			
R1	Comp, 47Ω, ±5%, 1/4W	1066-4705	Allen-Bradley	CB4705
R2	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R3	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Pot, 20k, ±20%, 1/2W, 4 turn	1203-0055	Bourns	3339H-1-203
R6	Comp, 47Ω, ±5%, 1/4W	1066-4705	Allen-Bradley	CB4705
R7	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R8	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R9	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R10	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R11	Pot, 5k, ±20%, 1/2W, 4 turn	1203-0054	Bourns	3339H-1-502
R12	Comp, 750Ω, ±5%, 1/4W	1066-7515	Allen-Bradley	CB7515
R13	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R14	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R15	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R16	Comp, 100Ω, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R17	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R18	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R19	Pot, 20k, ±20%, 1/2W, 4 turn	1203-0055	Bourns	3339H-1-203
R20	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R21	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R22	Comp, 390Ω, ±5%, 1/4W	1066-3915	Allen-Bradley	CB3915
R23	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R24	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
	TRANSISTORS			
Q1	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q2	Si, NPN, 2N3904	1272-0032	Motorola	2N3904







NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL FERRITE BEADS

Figure 6-20. Voltage Controlled Attenuator. 3600

6-85/6-86

1190 MHz - 1300 MHz OSCILLATOR. 3700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3700	Osc. 1190 MHz-1300 MHz			
	P.C. Board Assy	7001-0157	Cushman	
	P.C. Board	1780-0314	Cushman	
	CAPACITORS			
C1	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C2	Plate, Double sided Capacitor	2245-0044	Cushman	
C3	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C4	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C5	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C6	Chip, 22pF, ±5%, 50V	1012-0007	Varadyne	3BN050S220J(S)
C7	Cer, 10pF, ±10%, 100V	1005-0074	Erie	8101-100-C0G-100K
C8	Plate, Double sided Capacitor	2245-0044	Cushman	
C9	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C10	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S101K(S)
C11	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C12	Chip, 1.8pF, ±.25pF, 50V	1012-0008	Varadyne	3BN050S1R8C(S)
C13	Chip, 100pF, ±10%, 50V	1012-0004	Varadyne	3BX050S101K(S)
C14	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
	DIODE			
CR1	VHF Tuner, KV2103	1281-0057	Alpha Ind.	KV2103
	RESISTORS			
R1	Comp, 220Ω, ±5%, 1/2W	1067-2215	Allen-Bradley	EB2215
R2	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R3	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R4	Pot, 5k, ±20%, 1/2W, 4 turn	1203-0054	Bourns	3339H-1-502
R5	Metal Film, 50Ω, ±1%, 1/8W	1075-0112	ACI	RE-1/8, C-1-100PPM
R6	Comp, 330Ω, ±5%, 1/2W	1067-3315	Allen-Bradley	EB3315
R7	Metal Film, 50Ω, ±1%, 1/8W	1075-0112	ACI	RE-1/8, C-1-100PPM
R8	Metal Film, 50Ω, ±1%, 1/8W	1075-0112	ACI	RE-1/8, C-1-100PPM
R9	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R10	Comp, 390Ω, ±5%, 1/2W	1067-3915	Allen-Bradley	EB3915
	TRANSISTORS			
Q1	Si, NPN, FMT 5789	1272-0061	Fairchild	FMT 5789
Q2	Si, NPN, 2SC1424	1272-0071	NEC	2SC1424

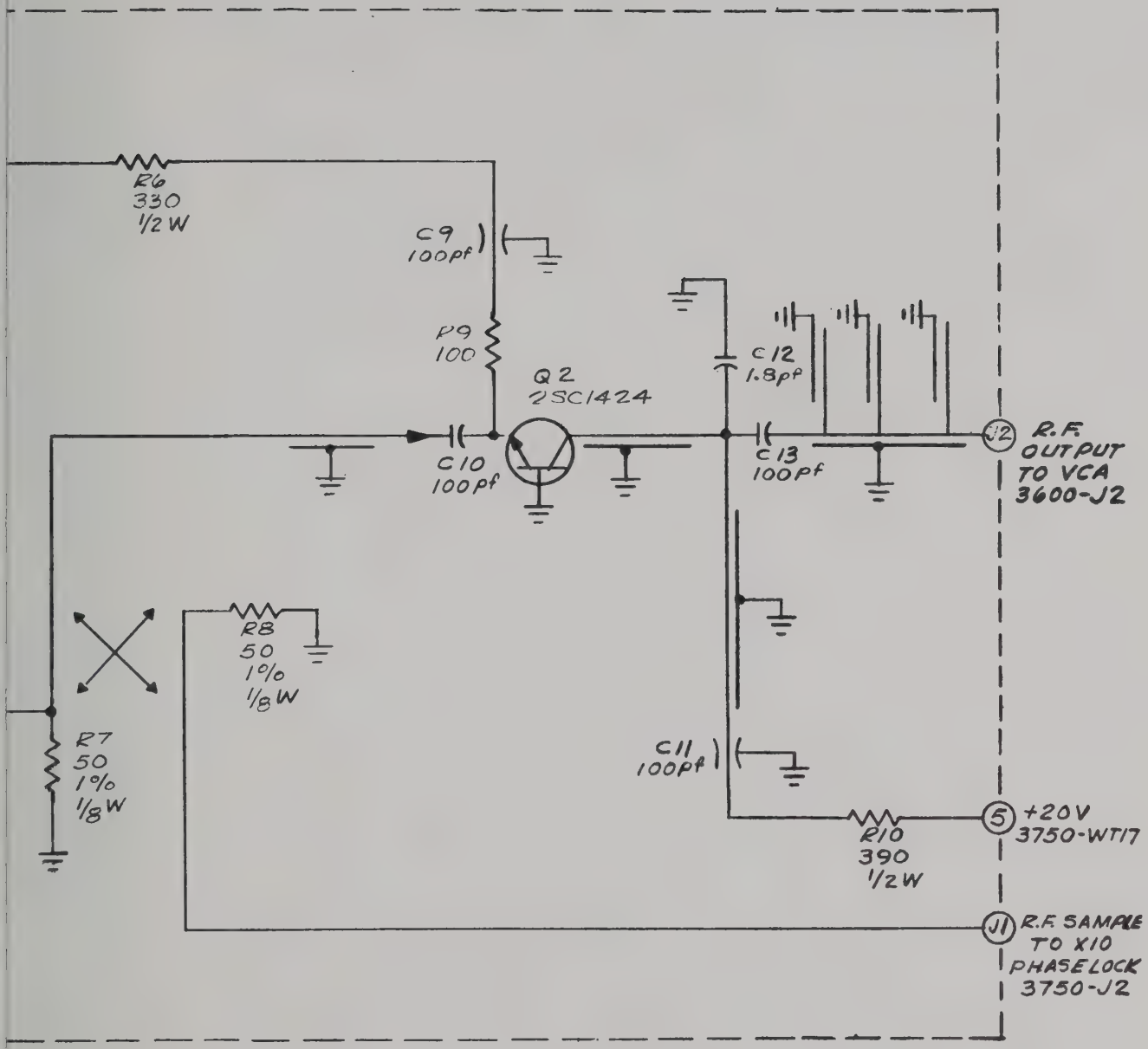
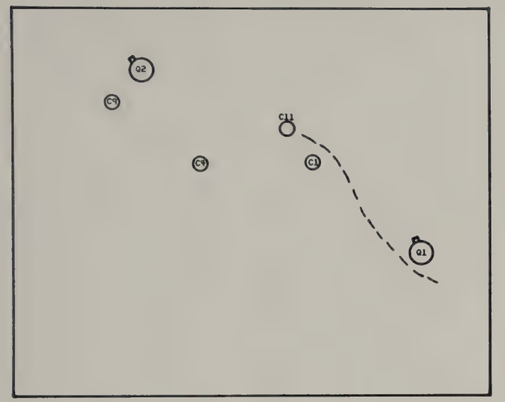
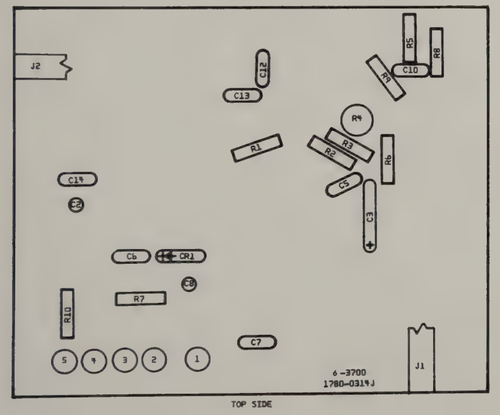


Figure 6-21. 1190 MHz - 1300 MHz Oscillator. 3700





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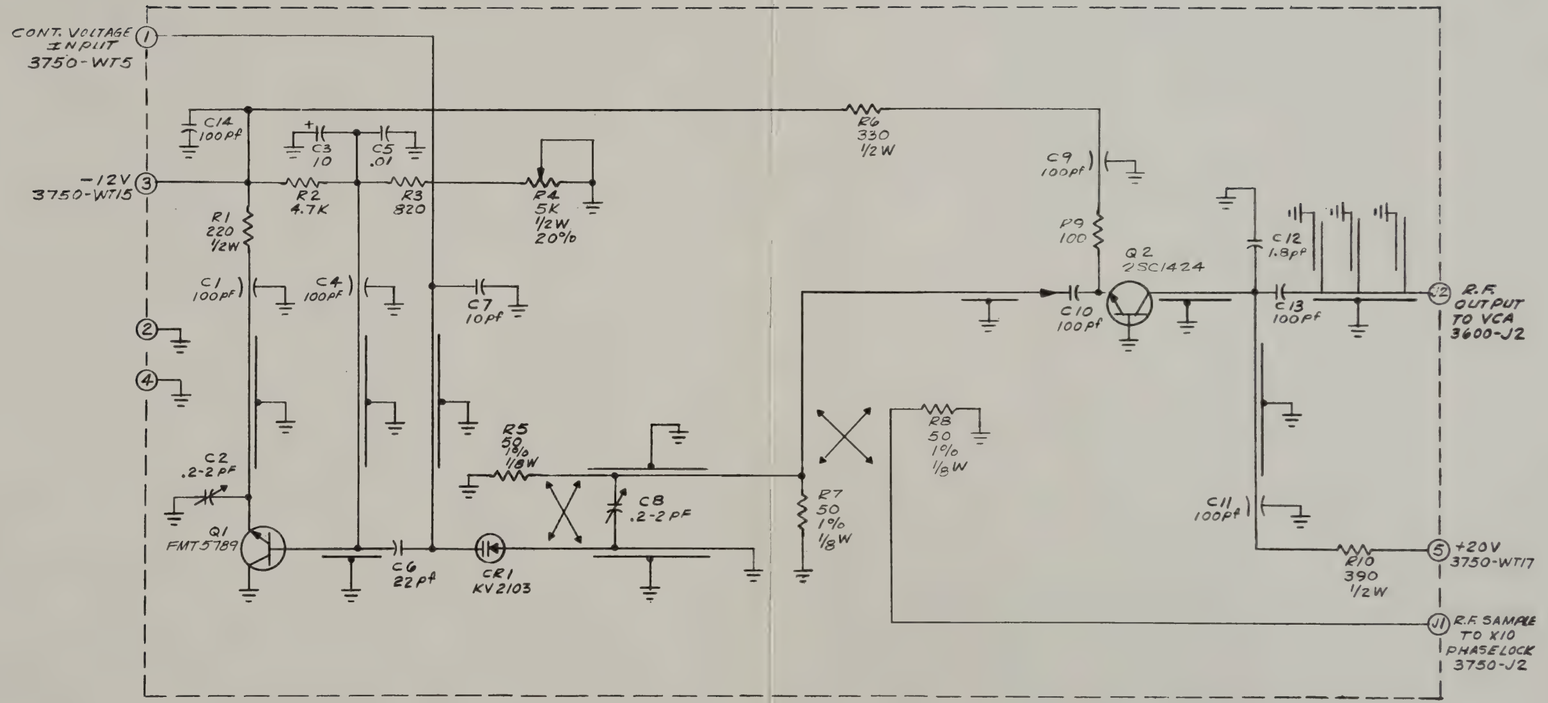


NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-21. 1190 MHz - 1300 MHz Oscillator. 3700

6-89/6-90

1190 MHz - 1300 MHz PHASELOCK. 3750

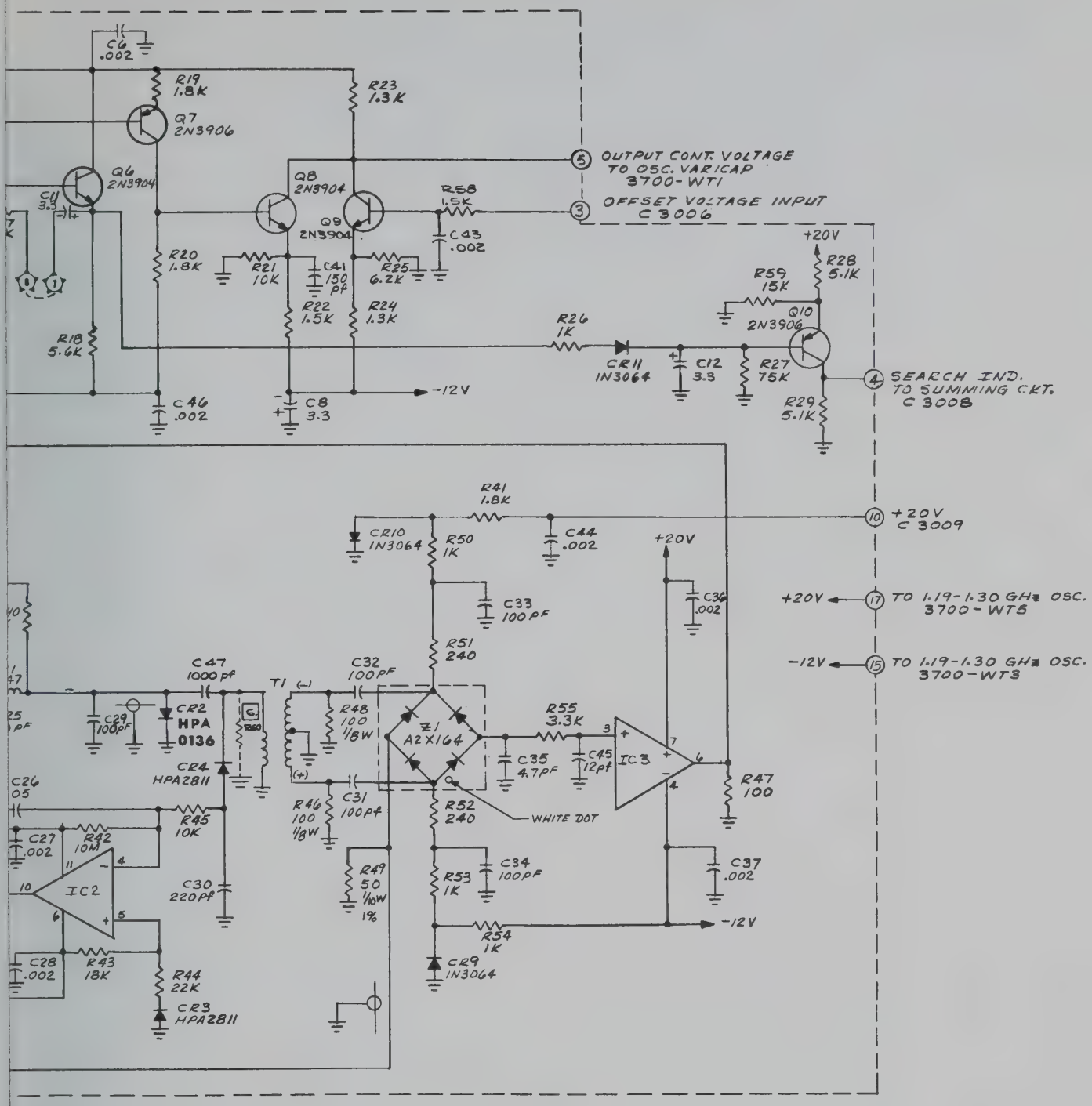
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3750	Phaselock, 1190-1300 MHz			
	P.C. Board Assy	7001-0158	Cushman	
	P.C. Board	1780-0271	Cushman	
	CABLE ASSEMBLY			
	Straight Bulkhead Jack	7032-0010-01	Cushman	
	CAPACITORS			
C1	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C2	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C3	Mica, 5pF, ±.5pF, 500V	1002-0028	Elmenco	DM15-C-050D
C4	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C5	Elect, 1.5μF, ±10%, 35V	1013-0001	Sprague	150D155X9035B2
C6	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C7	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C8	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C9	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C10	Poly, .027μF, ±1%, 50V	1008-0064	TRW	863UW
C11	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C12	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C13	Mica, 56pF, ±5%, 500V	1002-0019	Elmenco	DM15-E-560J
C14	Cer Trim, 5.5-18pF, 350V	1001-0008	Erie	538-002A-5.5-18
C15	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C16	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C17	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C18	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C19	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C20	Cer Trim, 9-35pF, 350V	1001-0006	Erie	538-002-94D
C21	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C22	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C23	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C24	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C25	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-F-201J
C26	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C27	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C28	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C29	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C30	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C31	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C32	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C33	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C34	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C35	Chip, 4.7pF, ±.25pF, 50V	1012-0009	Varadyne	3BN050S4R7C(S)
C36	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C37	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C38	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C39	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C40	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C41	Mica, 150pF, ±5%, 500V	1002-0021	Elmenco	DM15-F-151J
C42	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C43	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C44	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C45	Mica, 12pF, ±5%, 500V	1002-0017	Elmenco	DM15-C-120J

1190 MHz - 1300 MHz PHASELOCK (cont). 3750

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C46	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C47	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
	COILS			
L1	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L2	Coil, .064μH, RF	1596-0058-02	Cushman	
L3	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L4	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L5	Coil, .114μH, RF	1596-0058-04	Cushman	
L6	Coil, .098μH, RF	1596-0058-03	Cushman	
L7	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L8	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L9	Choke, 1.5μH, ±10%, Molded	1585-0038	Delevan	1537-16
L10	Coil, .131μH, RF	1596-0058-05	Cushman	
L11	Coil, .047μH, RF	1596-0058-01	Cushman	
	DIODES			
CR1	Silicon Pin, NPA 3080	1281-0055	HPA	HPA-3080
CR2	Step Recovery, HPA-0136	1282-0006	HPA	HPA-0136
CR3	Hot Carrier, HPA-2811	1283-0004	HPA	HPA-2811
CR4	Hot Carrier, HPA-2811	1283-0004	HPA	HPA-2811
CR5	Not Used			
CR6	Not Used			
CR7	Not Used			
CR8	Not Used			
CR9	Silicon, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR10	Silicon, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR11	Silicon, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
Z1	Diodes, Bridge Quad	1281-0056	Aertech	A2X164
	INTEGRATED CIRCUITS			
IC1	Deferential/Cascade Ampl	2025-0061	RCA	CA3028B
IC2	High Performance Op Ampl	2025-0022	T.I.	SN72741N
IC3	Voltage Follower, LM302H	2025-0029	National	LM302H
	RESISTORS			
R1	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R2	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R3	Metal Film, 75Ω, ±1%, 1/8W	1075-0035	Dale	MFF 1/8 T1
R4	Metal Film, 2.43k, ±1%, 1/8W	1075-0019	Dale	MFF 1/8 T1
R5	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R6	Comp, 56Ω, ±5%, 1/4W	1066-5606	Allen-Bradley	CB5606
R7	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R8	Pot, 10k, ±20%, 1/2W	1215-0019	Beckman	66WR10K
R9	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R10	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R11	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R12	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R13	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R14	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R15	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R16	Comp, 22Ω, ±5%, 1/4W	1066-2205	Allen-Bradley	CB2205
R17	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R18	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R19	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R20	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825

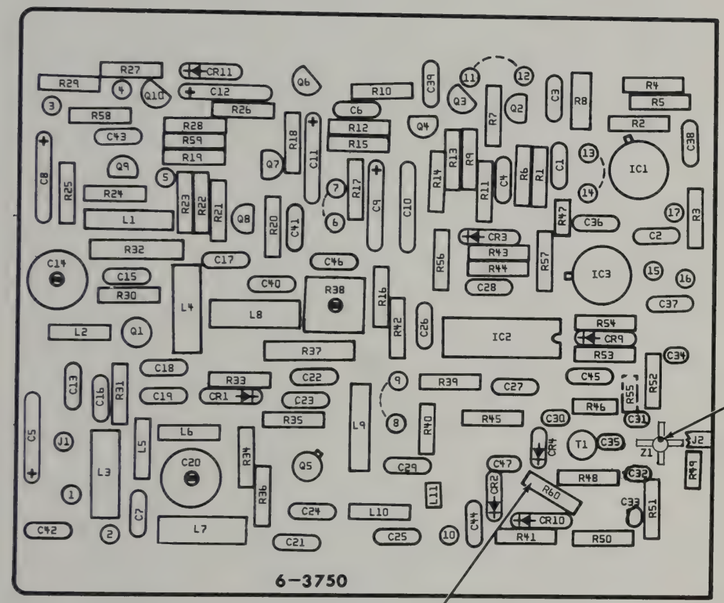
1190 MHz - 1300 MHz PHASELOCK (cont). 3750

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R21	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R22	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R23	Comp, 1.3k, ±5%, 1/4W	1066-1325	Allen-Bradley	CB1325
R24	Comp, 1.3k, ±5%, 1/4W	1066-1325	Allen-Bradley	CB1325
R25	Comp, 6.2k, ±5%, 1/4W	1066-6225	Allen-Bradley	CB6225
R26	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R27	Comp, 75k, ±5%, 1/4W	1066-7535	Allen-Bradley	CB7535
R28	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R29	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R30	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R31	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R32	Comp, 680Ω, ±5%, 1/2W	1067-6815	Allen-Bradley	EB6815
R33	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R34	Comp, 15Ω, ±5%, 1/4W	1066-1505	Allen-Bradley	CB1505
R35	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R36	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R37	Comp, 390Ω, ±5%, 1/2W	1067-3915	Allen-Bradley	CB3915
R38	Pot, 20k, ±20%, 1W	1200-0028	CTS	360T203B
R39	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R40	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R41	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R42	Comp, 10Meg, ±5%, 1/4W	1066-1065	Allen-Bradley	CB1065
R43	Comp, 18k, ±5%, 1/4W	1066-1835	Allen-Bradley	CB1835
R44	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R45	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R46	Comp, 100Ω, ±5%, 1/8W	1065-1015	Allen-Bradley	BB1015
R47	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R48	Comp, 100Ω, ±5%, 1/8W	1065-1015	Allen-Bradley	BB1015
R49	Metal Film, 50Ω, ±1%, 1/8W	1075-0112	ACI	RE-1/8, C-1-100 PPM
R50	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R51	Comp, 240Ω, ±5%, 1/4W	1066-2415	Allen-Bradley	CB2415
R52	Comp, 240Ω, ±5%, 1/4W	1066-2415	Allen-Bradley	CB2415
R53	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R54	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R55	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R56	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R57	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R58	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R59	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R60	Comp, FSV, ±5%, 1/4W	1066-xxxx		
	TRANSFORMER			
T1	Toroidal Bifilar	1579-0028	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N3643	1272-0066	Fairchild	2N3643
Q2	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q3	Si, NPN, 2N5089	1272-0031	Motorola	2N5089
Q4	Si, NPN, 2N5089	1272-0031	Motorola	2N5089
Q5	Si, NPN, 2N3866	1271-0005	RCA	2N3866
Q6	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q7	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q8	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q9	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q10	Si, PNP, 2N3906	1272-0037	Motorola	2N3906

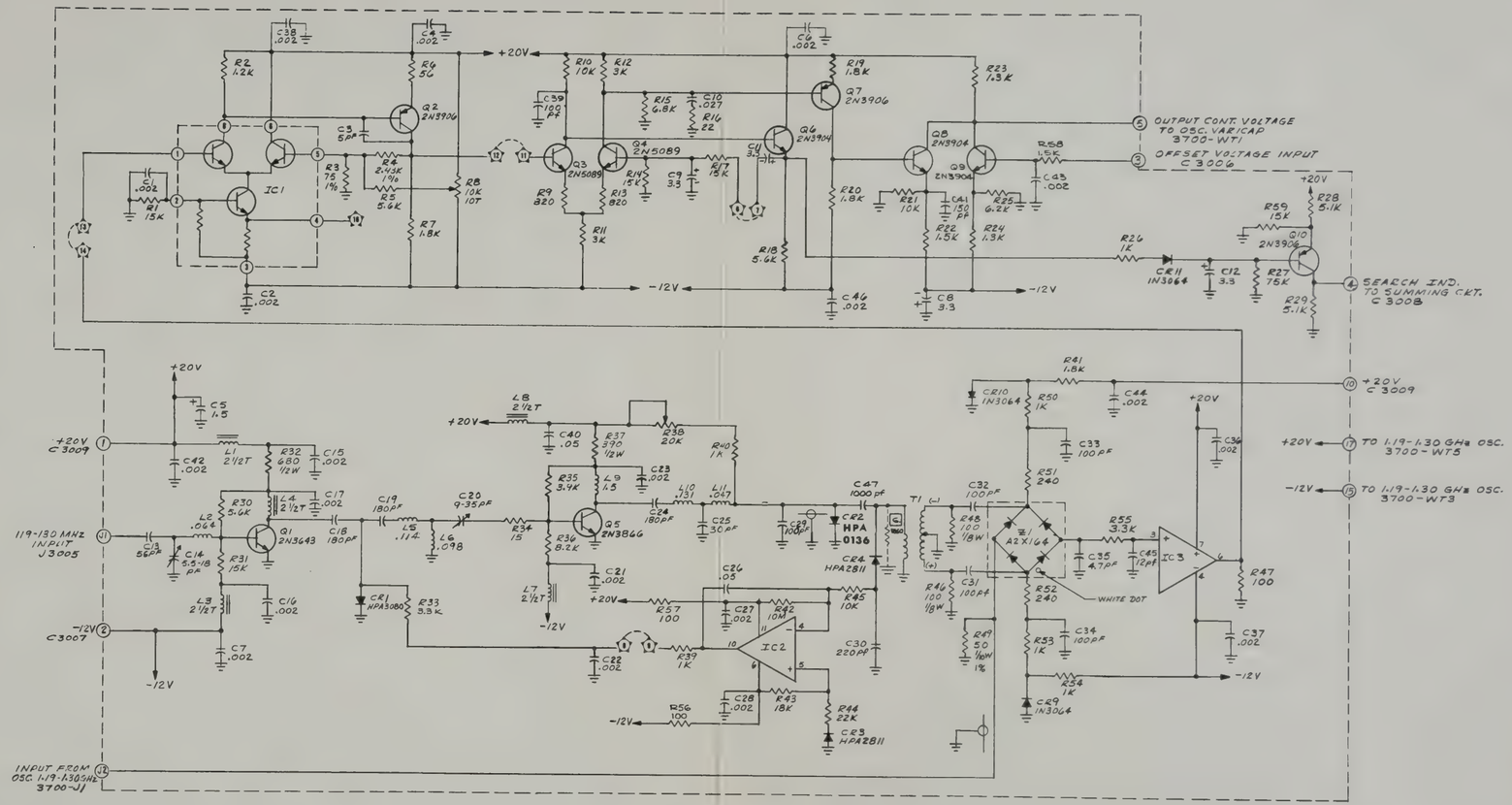


NO.	TYPE
	CA3028B
	SN7274IN
	LM302H

Figure 6-22. 1190 MHz - 1300 MHz Phaselock. 3750



NOTE: [1.] FACTORY SELECT. REMOVED AFTER TESTING.



IC NO.	TYPE
1	CA3028B
2	SN7274N
3	LM302H

NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

[1.] FACTORY SELECT. REMOVED AFTER TESTING.

5601**0040

Figure 6-22. 1190 MHz - 1300 MHz Phaselock. 3750

6-95/6-96

1300 MHz - 2200 MHz OSCILLATOR. 3800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3800	Oscillator, 1300-2200 MHz			
	P.C. Board Assy	7001-0159	Cushman	
	P.C. Board	1780-0278	Cushman	
	CAPACITORS			
C1	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C2	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C3	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C4	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C5	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C6	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C7	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C8	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C9	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C10	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C11	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C12	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C13	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C14	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C15	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C16	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C17	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C18	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C19	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C20	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C21	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C22	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C23	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C24	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C25	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C26	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C27	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C28	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C29	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C30	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C31	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C32	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C33	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C34	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C35	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C36	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C37	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C38	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C39	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C40	Feed thru, 100pF, ±20%, 250V	1005-0080	Aerovox	EF-5
C41	Plate, Single Sided Capacitor	2245-0043	Cushman	
C42	Plate, Single Sided Capacitor	2245-0043	Cushman	
C43	Plate, Single Sided Capacitor	2245-0043	Cushman	
C44	Plate, Single Sided Capacitor	2245-0043	Cushman	
C45	Plate, Single Sided Capacitor	2245-0043	Cushman	
C46	Plate, Single Sided Capacitor	2245-0043	Cushman	
C47	Plate, Single Sided Capacitor	2245-0043	Cushman	
C48	Plate, Single Sided Capacitor	2245-0043	Cushman	
C49	Plate, Single Sided Capacitor	2245-0043	Cushman	
C50	Plate, Single Sided Capacitor	2245-0043	Cushman	

1300 MHz - 2200 MHz OSCILLATOR (cont). 3800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	COILS			
L1	Coil, Air Core	1596-0061	Cushman	
L2	Coil, Air Core	1596-0061	Cushman	
L3	Coil, Air Core	1596-0061	Cushman	
L4	Coil, Air Core	1596-0061	Cushman	
L5	Coil, Air Core	1596-0061	Cushman	
L6	Coil, Air Core	1596-0061	Cushman	
L7	Coil, Air Core	1596-0061	Cushman	
L8	Coil, Air Core	1596-0061	Cushman	
L9	Coil, Air Core	1596-0061	Cushman	
L10	Coil, Air Core	1596-0061	Cushman	
	CONNECTORS			
J1	RF Straight Coaxial, Subminiature	2536-0036	Sealectro	50-051
	RESISTORS			
R1	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R2	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R3	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R4	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R5	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R6	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R7	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R8	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R9	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R10	Pot, 1k, ±20%, 1W	1200-0024	CTS	360T102B
R11	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R12	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R13	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R14	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R15	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R16	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R17l	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R18	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R19	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R20	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R21	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R22	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R23	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R24	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R25	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R26	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R27	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R28	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R29	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R30	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R31	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R32	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R33	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R34	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R35	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R36	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R37	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R38	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R39	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R40	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015

1300 MHz - 2200 MHz OSCILLATOR (cont). 3800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R41	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R42	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R43	Metal Film, 50Ω, ±1%, 1/8W	1075-0112	ACI	RE-1/8, C-1, 100 PPM
	TRANSISTORS			
Q1	Si, NPN, 2SC1424	1272-0071	NEC	2SC1424
Q2	Si, NPN, FMT5789	1272-0061	Fairchild	FMT5789
Q3	Si, NPN, 2SC1424	1272-0071	NEC	2SC1424
Q4	Si, NPN, FMT5789	1272-0061	Fairchild	FMT5789
Q5	Si, NPN, FMT5789	1272-0061	Fairchild	FMT5789
Q6	Si, NPN, FMT5789	1272-0061	Fairchild	FMT5789
Q7	Si, NPN, 2SC1424	1272-0071	NEC	2SC1424
Q8	Si, NPN, FMT5789	1272-0061	Fairchild	FMT5789
Q9	Si, NPN, 2SC1424	1272-0071	NEC	2SC1424
Q10	Si, NPN, FMT5789	1272-0061	Fairchild	FMT5789

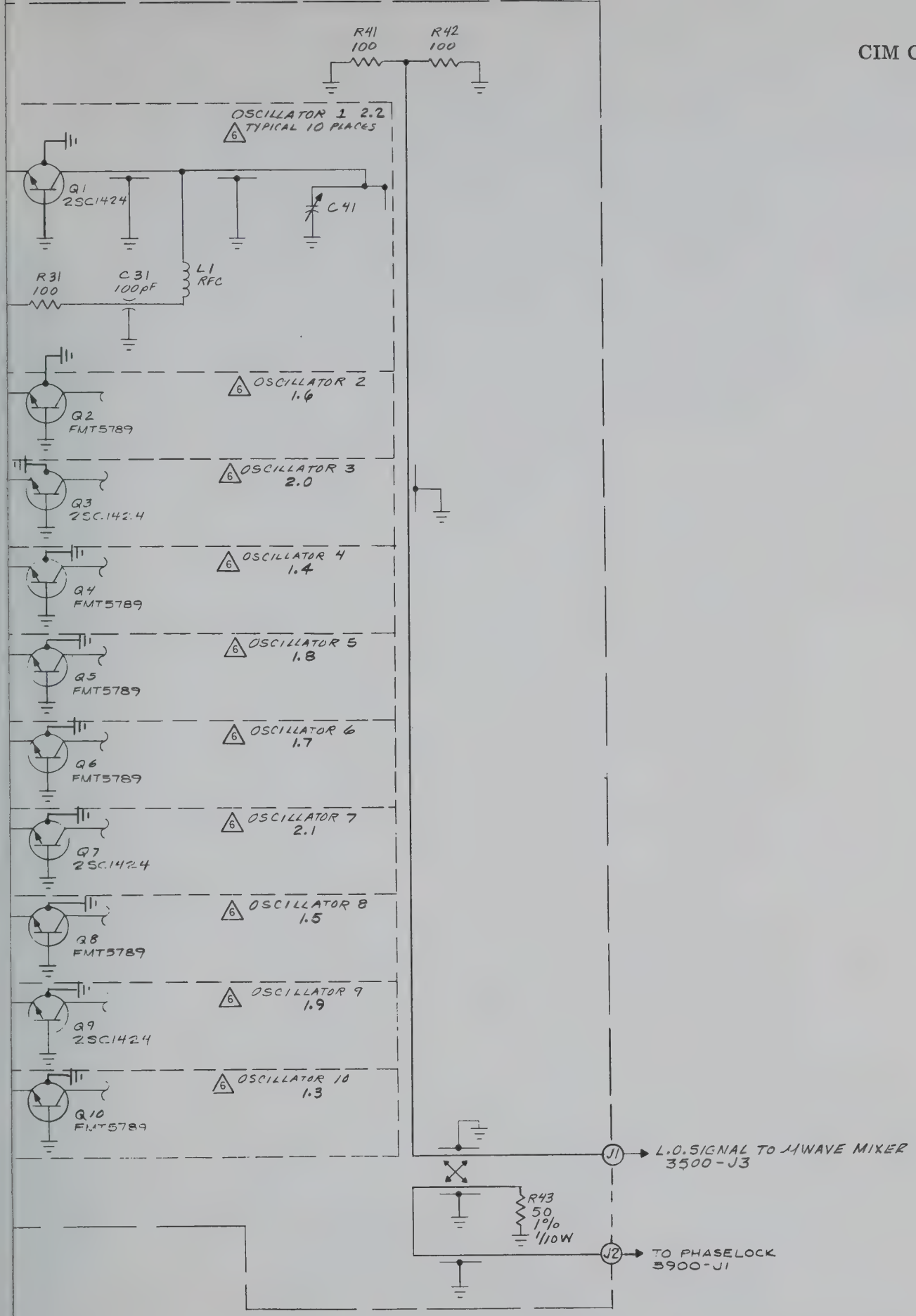
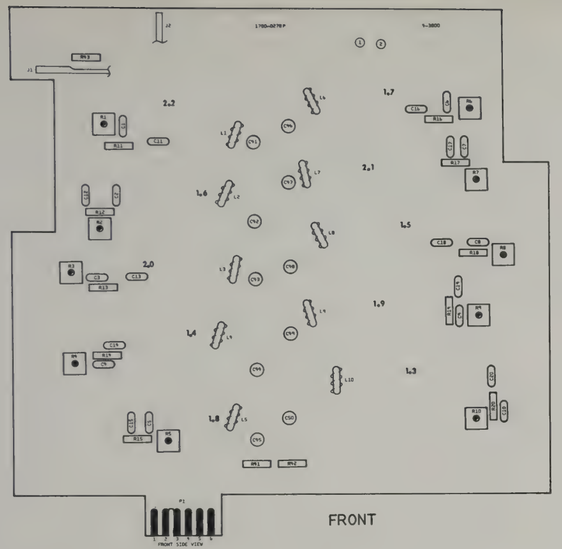
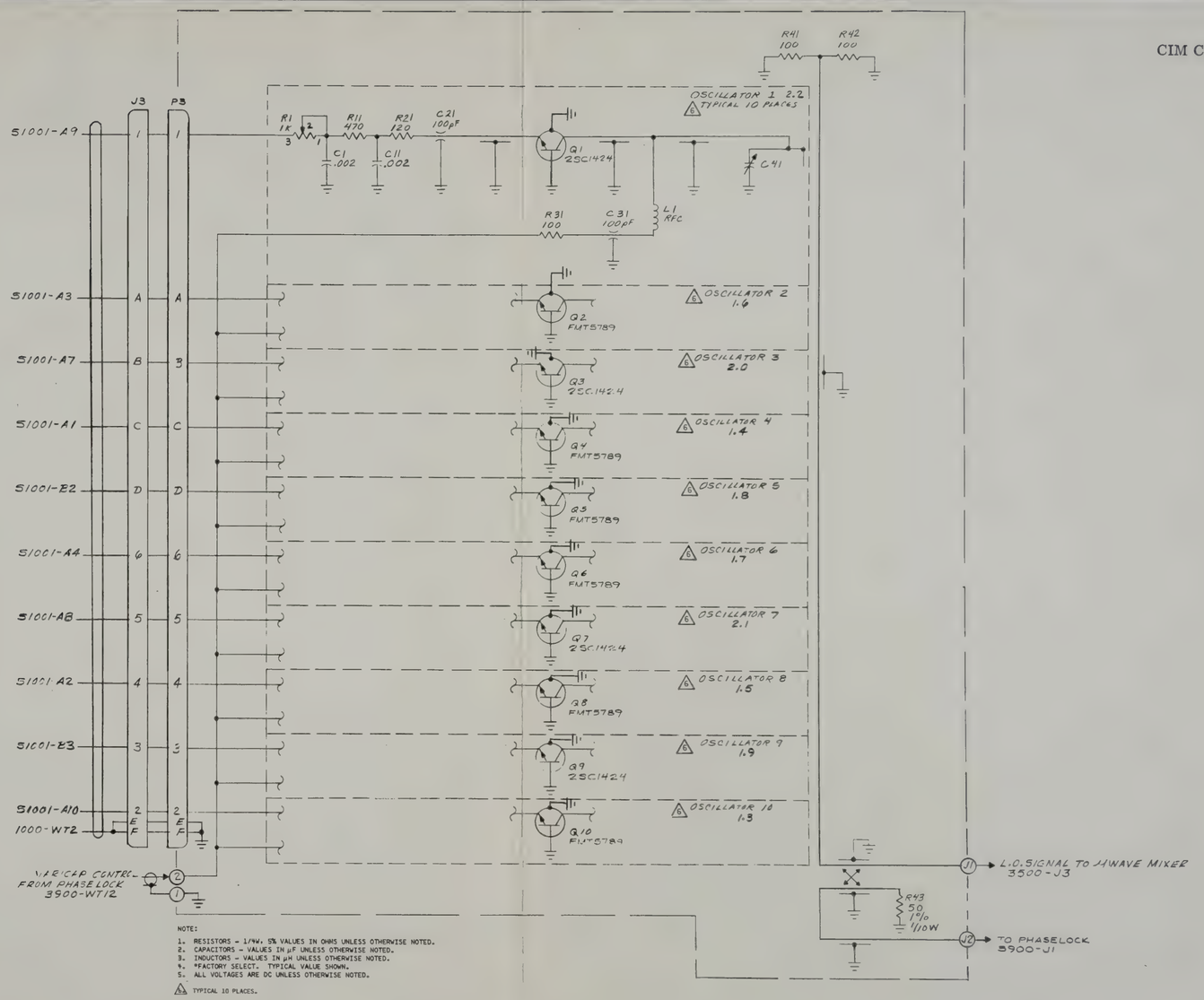


Figure 6-23. 1300 MHz - 2200 MHz Oscillator. 3800





NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

△ TYPICAL 10 PLACES.

Figure 6-23. 1300 MHz - 2200 MHz Oscillator. 3800 6-101/6-102

1300 MHz - 2200 MHz PHASELOCK. 3900

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3900	Phaselock, 1300 MHz - 2200 MHz			
	P.C. Board Assy	7001-0160	Cushman	
	P.C. Board	1780-0274	Cushman	
	CABLE ASSEMBLY			
	8" RG-188 Straight Bulkhead Jack to Ferrule	7032-0010-03	Cushman	
	CAPACITORS			
C1	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C2	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C3	Mica, 5pF, ±.5pF, 500V	1002-0028	Elmenco	DM15-C-050D
C4	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C5	Elect, 1.5μF, ±10%, 35V	1013-0001	Sprague	150D155X9035B2
C6	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C7	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C8	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C9	Elect, 1.5μF, ±10%, 35V	1013-0001	Sprague	150D155X9035B2
C10	Poly, .047μF, ±10%, 100V	1008-0049	Sprague	225P47391WA3
C11	Elect, 1.5μF, ±10%, 35V	1013-0001	Sprague	150D155X9035B2
C12	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C13	Mica, 56pF, ±5%, 500V	1002-0019	Elmenco	DM15-E-560J
C14	Cer, Trim, 5.5-18pF, 350V	1001-0008	Erie	538-002A-5.5-18
C15	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C16	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C17	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C18	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C19	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C20	Cer Trim, 9-35pF, 350V	1001-0006	Erie	538-002-94D
C21	Not Used			
C22	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C23	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C24	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C25	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C26	Mica, 36pF, ±5%, 500V	1002-0041	Elmenco	DM15-E-360J
C27	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C28	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C29	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C30	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C31	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C32	Cer, 220pF, ±10%, 100V	1005-0075	Erie	8101-A100-W5R0-221K
C33	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C34	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C35	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C36	Chip, 4.7pF, ±.25pF, 50V	1012-0009	Varadyne	3BN050S4R7C(S)
C37	Cer, 100pF, ±10%, 100V	1005-0082	Erie	8121-100-C0G-101K
C38	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C39	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C40	Cer, 1000pF, ±10%, 100V	1005-0081	Erie	8121-100-W5R-102K
C41	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C42	Mica, 12pF, ±5%, 500V	1002-0017	Elmenco	DM15-C-120J

1300 MHz - 2200 MHz PHASELOCK (cont). 3900

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	COILS			
L1	Coil, .064μH	1596-0058-02	Cushman	
L2	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L3	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L4	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L5	RF Choke, .22μH, ±20%	1585-0039	Delevan	1537-02
L6	RF Choke, .1μH	1585-0041	Delevan	2307-101
L7	Not Used			
L8	RF Choke, 2.2μH, ±10%	1585-0013	Delevan	1537-20
L9	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L10	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L11	RF Choke, 1.5μH, ±10%	1585-0038	Delevan	1537-16
L12	Coil, .131μH	1596-0058-05	Cushman	
L13	RF Choke, 2.2μH, ±10%	1585-0013	Delevan	1537-20
L14	Coil, .064μH	1596-0058-02	Cushman	
L15	RF Choke, 2.2μH, ±10%	1585-0013	Delevan	1537-20
L16	RF Choke, 2.2μH, ±10%	1585-0013	Delevan	1537-20
	DIODES			
CR1	Silicon pin, HPA-3080	1281-0055	HPA	HPA-3080
CR2	Silicon, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR3	Step Recovery, HPA-0136	1282-0006	HPA	HPA-0136
CR4	Silicon, Hot Carrier, HPA-2811	1283-0004	HPA	HPA-2811
CR5	Silicon, Hot Carrier, HPA-2811	1283-0004	HPA	HPA-2811
CR6	Not Used			
CR7	Not Used			
CR8	Not Used			
CR9	Not Used			
CR10	Silicon, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR11	Silicon, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR12	Silicon, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR13	Silicon, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
Z1	Bridge Quad, A2x164	1281-0056	Aertech	A2X164
	INTEGRATED CIRCUITS			
IC1	Differential/Cascade Ampl	2025-0061	RCA	CA3028B
IC2	High Performance Op Ampl	2025-0022	T. I.	2N72741N
IC3	Voltage Follower	2025-0029	National	LM302H
	RESISTORS			
R1	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R2	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R3	Metal Film, 75Ω, ±1%, 1/8W	1075-0035	Dale	MFF 1/8 T1
R4	Metal Film, 2.43k, ±1%, 1/8W	1075-0019	Dale	MFF 1/8 T1
R5	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R6	Comp, 56Ω, ±5%, 1/4W	1066-5605	Allen-Bradley	CB5605
R7	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R8	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89 WR
R9	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R10	Comp, 1.3k, ±5%, 1/4W	1066-1325	Allen-Bradley	CB1325
R11	Comp, 3.6k, ±5%, 1/4W	1066-3625	Allen-Bradley	CB3625
R12	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R13	Comp, 1.1k, ±5%, 1/4W	1066-1125	Allen-Bradley	CB1125
R14	Comp, 18k, ±5%, 1/4W	1066-1835	Allen-Bradley	CB1835
R15	Comp, 7.5k, ±5%, 1/4W	1066-7525	Allen-Bradley	CB7525

1300 MHz - 2200 MHz PHASELOCK (cont). 3900

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R16	Comp, 43Ω, ±5%, 1/4W	1066-4305	Allen-Bradley	CB4305
R17	Comp, 7.5k, ±5%, 1/4W	1066-7525	Allen-Bradley	CB7525
R18	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R19	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R20	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R21	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R22	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R23	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R24	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R25	Comp, 75k, ±5%, 1/4W	1066-7535	Allen-Bradley	CB7535
R26	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R27	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R28	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R29	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R30	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R31	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R32	Comp, 680Ω, ±5%, 1/2W	1067-6815	Allen-Bradley	EB6815
R33	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R34	Comp, 15Ω, ±5%, 1/4W	1066-1505	Allen-Bradley	CB1505
R35	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R36	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R37	Comp, 390Ω, ±5%, 1/2W	1067-3915	Allen-Bradley	EB3915
R38	Pot, 20k, ±20%, 1W	1200-0028	CTS	360T203B
R39	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R40	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R41	Comp, 10Meg, ±5%, 1/4W	1066-1065	Allen-Bradley	CB1065
R42	Comp, 18k, ±5%, 1/4W	1066-1835	Allen-Bradley	CB1835
R43	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R44	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R45	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R46	Not Used			
R47	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R48	Metal Film, 50Ω, ±1%, 1/8W	1075-0112	ACI	RE-1/8, C-1-100 PPM
R49	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R50	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R51	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R52	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R53	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R54	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R55	Comp, 4.3k, ±5%, 1/4W	1066-4325	Allen-Bradley	CB4325
R56	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R57	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R58	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R59	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R60	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R61	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R62	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R63	Comp, FSV, ±5%, 1/4W	1066-xxxx		
	TRANSFORMER			
T1	Toroidal, Fifilar	1579-0027	Cushman	

1300 MHz - 2200 MHz PHASELOCK (cont). 3900

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, NPN, 2N3643	1272-0066	Fairchild	2N3643
Q2	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q3	Si, NPN, 2N5089	1272-0031	Motorola	2N5089
Q4	Si, NPN, 2N5089	1272-0021	Motorola	2N5089
Q5	Si, NPN, 2N3866	1271-0005	RCA	2N3866
Q6	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q7	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q8	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q9	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q10	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q11	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q12	Si, NPN, 2N3904	1272-0032	Motorola	2N3904

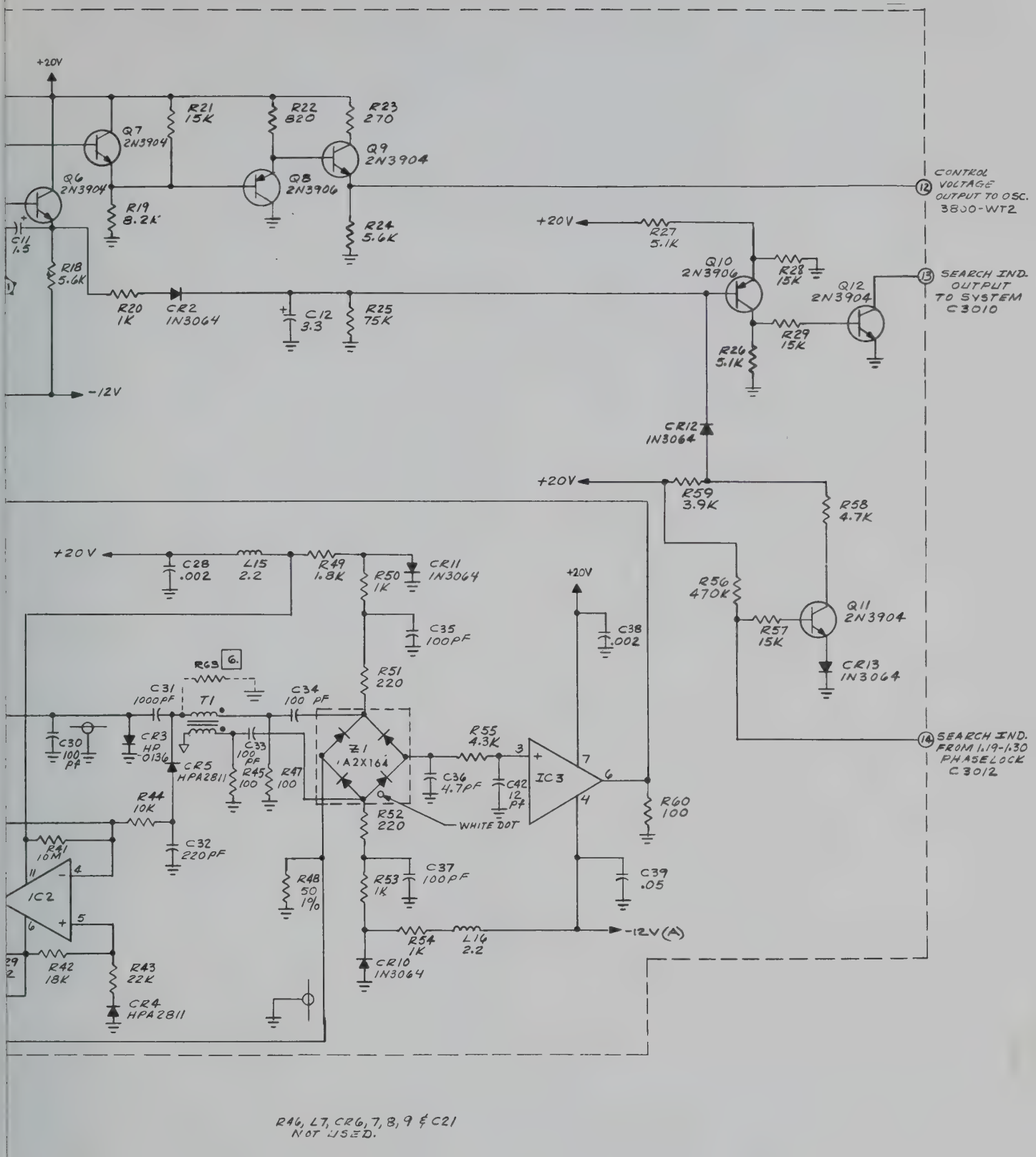
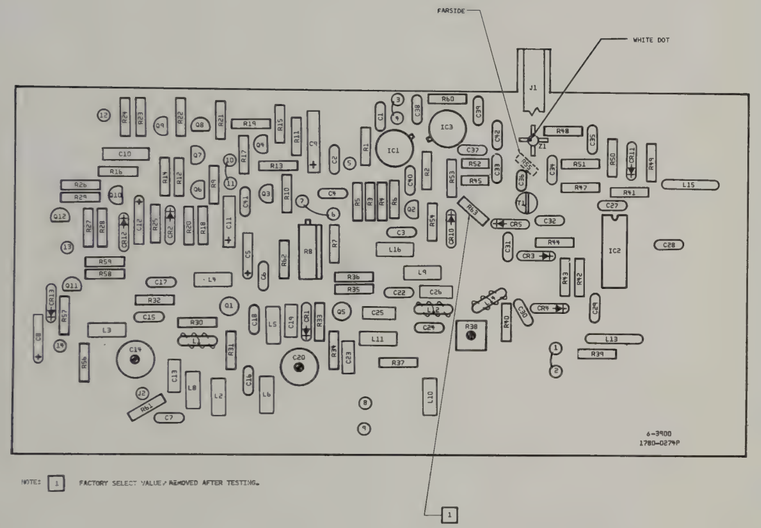
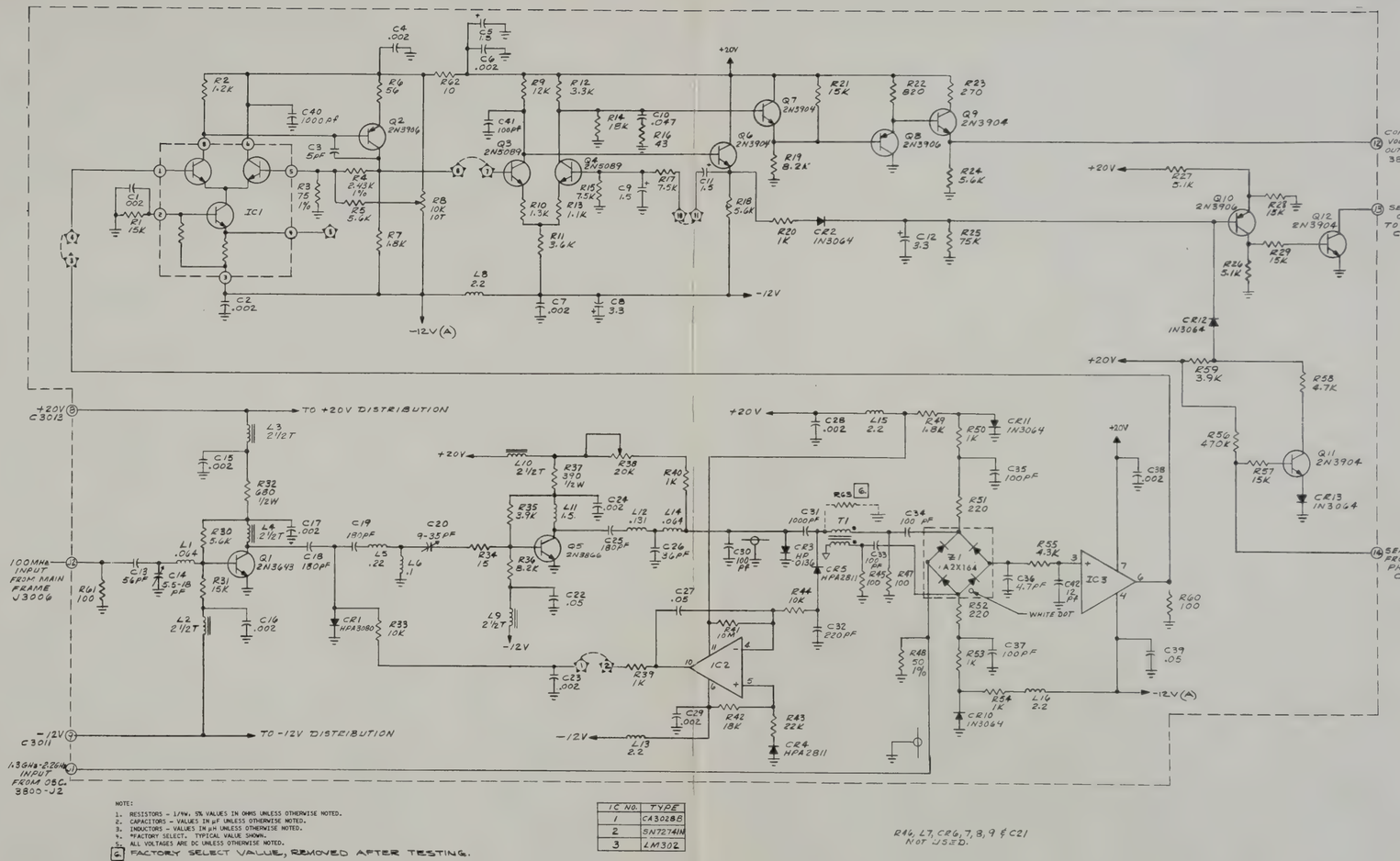


Figure 6-24. 1300 MHz - 2200 MHz Phaselock. 3900

1300 MHz - 2200 MHz PHASELOCK (cont). 3900

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, NPN, 2N3643	1272-0066	Fairchild	2N3643
Q2	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q3	Si, NPN, 2N5089	1272-0031	Motorola	2N5089
Q4	Si, NPN, 2N5089	1272-0021	Motorola	2N5089
Q5	Si, NPN, 2N3866	1271-0005	RCA	2N3866
Q6	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q7	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q8	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q9	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q10	Si, PNP, 2N3906	1272-0037	Motorola	2N3906
Q11	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q12	Si, NPN, 2N3904	1272-0032	Motorola	2N3904





NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

[1] FACTORY SELECT VALUE, REMOVED AFTER TESTING.

IC NO.	TYPE
1	CA3028B
2	SN7274N
3	LM302

R44, L7, CR6, 7, 8, 9 & C21 NOT USED.

Figure 6-24. 1300 MHz - 2200 MHz Phaselock. 3900

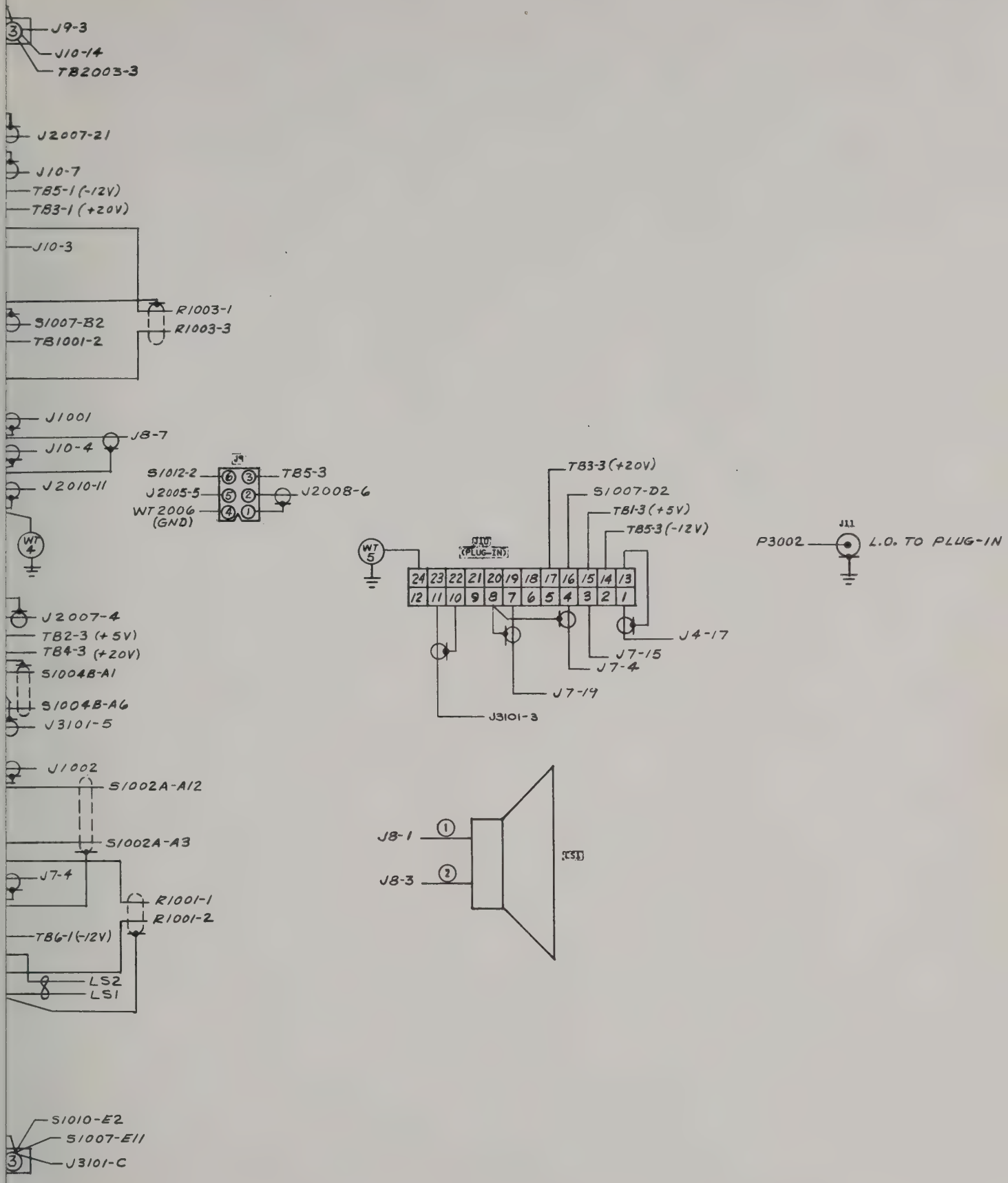


Figure 6-25. Main Chassis, Right Side, Interconnection Diagram. 4000

6-109/6-110

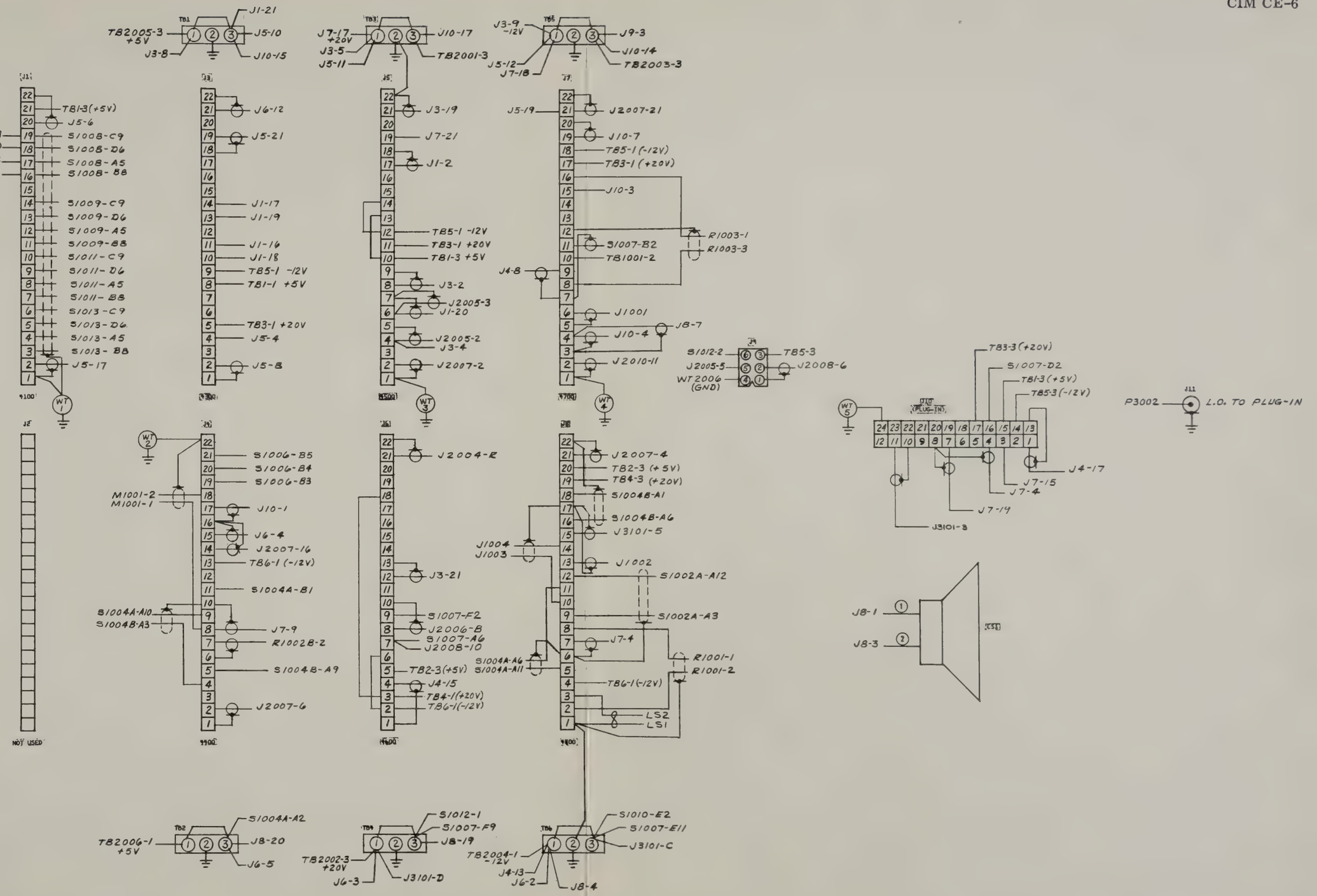
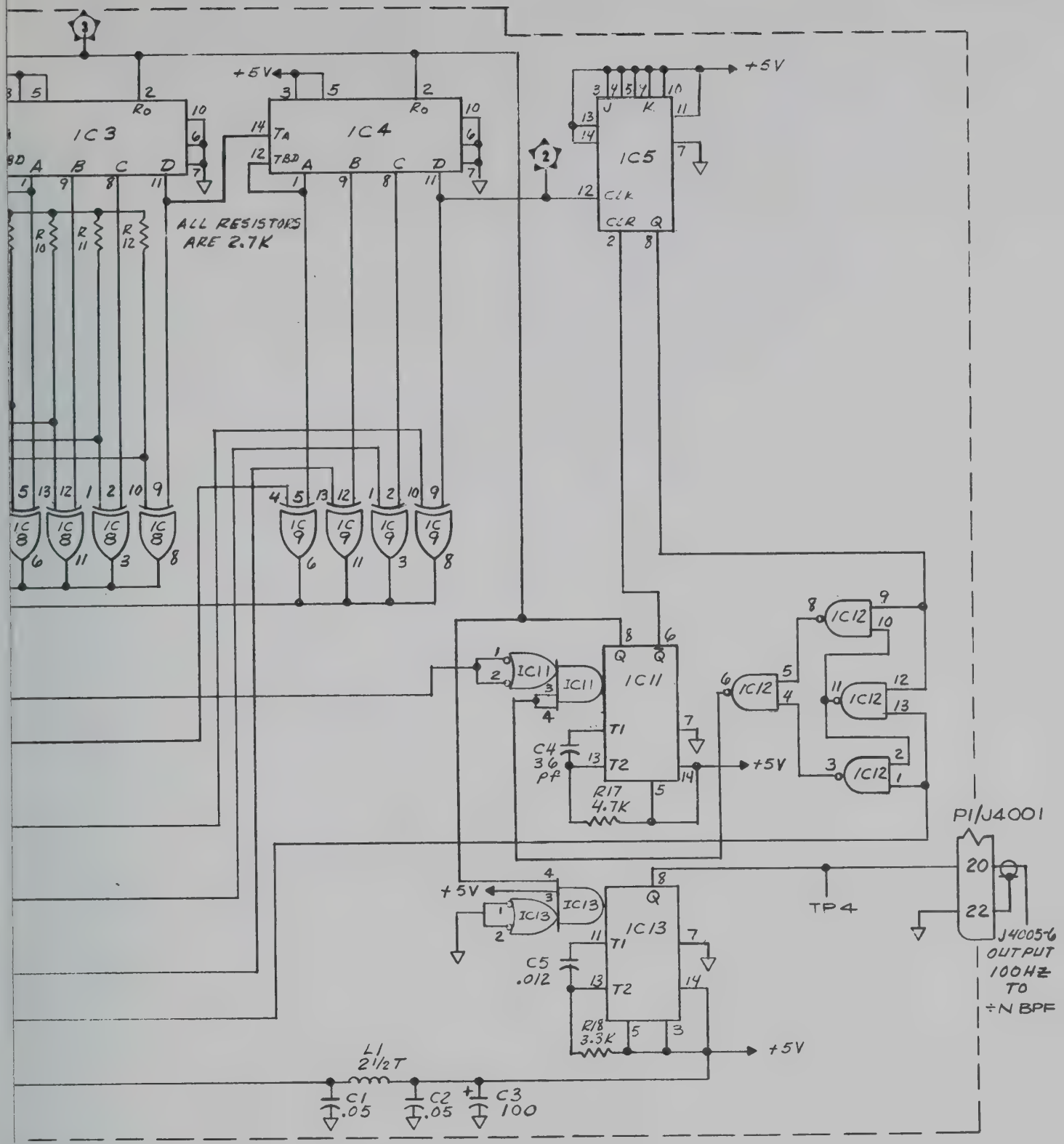


Figure 6-25. Main Chassis, Right Side, Interconnection Diagram. 4000

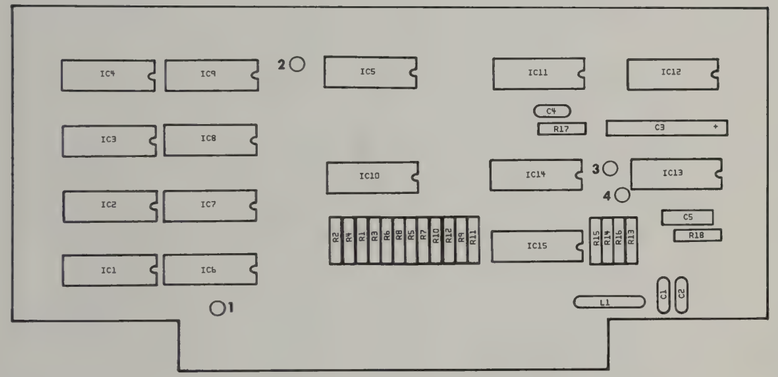
100 Hz DIVIDE-BY-N. 4100

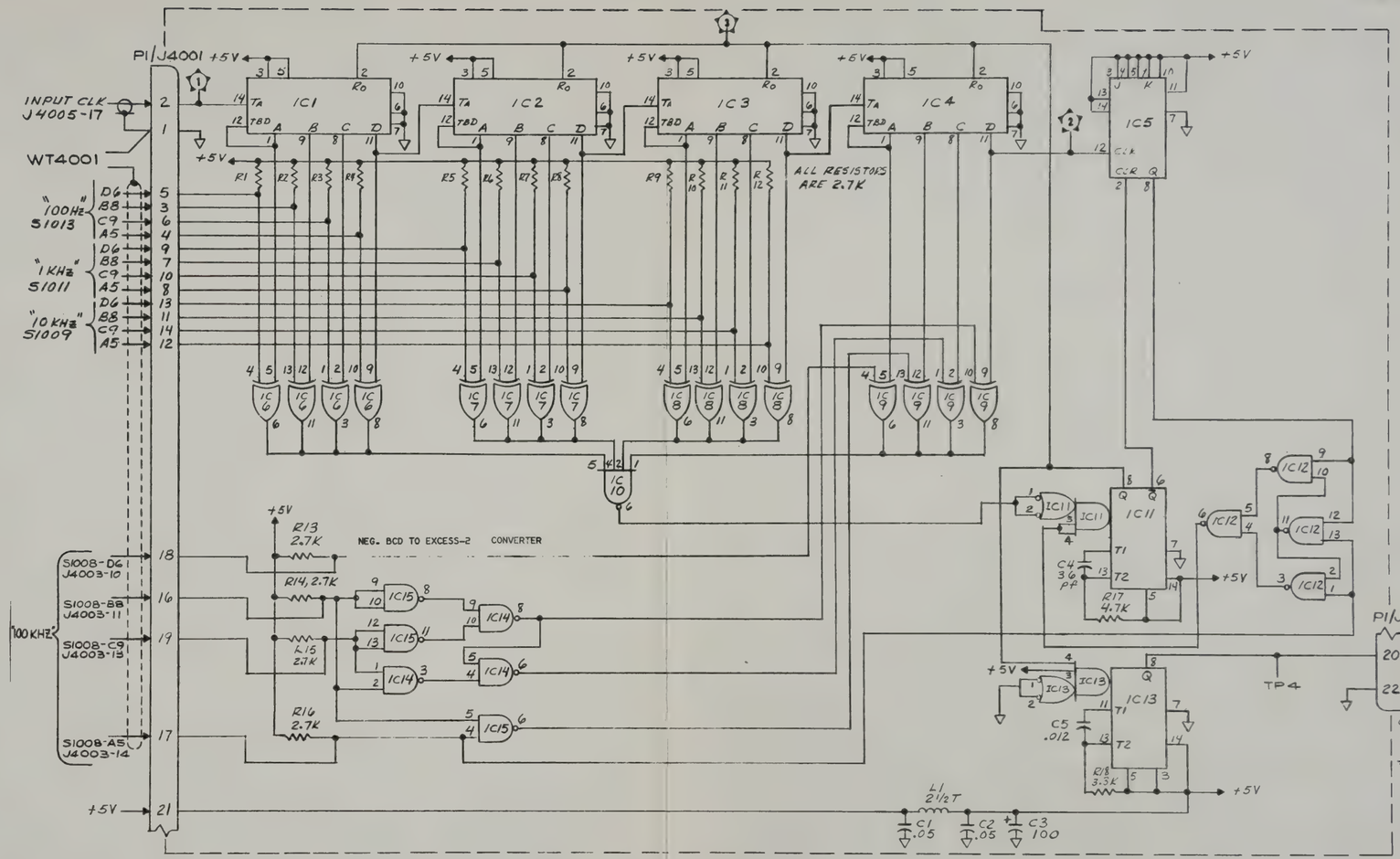
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4100	Divide-By-N, 100 Hz			
	P.C. Board Assy	7001-0161	Cushman	
	P.C. Board	1780-0287	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C4	Mica, 36pF, ±5%, 500V	1002-0041	Elmenco	DM15-E-360J
C5	Poly, .012μF, ±10%, 100V	1008-0040	Sprague	225P12391WA3
	COIL			
L1	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
	INTEGRATED CIRCUITS			
IC1	TTL Decade Counter	2025-0002	T.I.	2N7490N
IC2	TTL Decade Counter	2025-0002	T.I.	2N7490N
IC3	TTL Decade Counter	2025-0002	T.I.	2N7490N
IC4	TTL Decade Counter	2025-0002	T.I.	2N7490N
IC5	TTL Dual Flip-Flop	2025-0007	T.I.	2N7472N
IC6	Quad, 2-input Ex OR-Gate	2025-0045	Motorola	MC1812P
IC7	Quad, 2-input Ex OR-Gate	2025-0045	Motorola	MC1812P
IC8	Quad, 2-input Ex OR-Gate	2025-0045	Motorola	MC1812P
IC9	Quad, 2-input Ex OR-Gate	2025-0045	Motorola	MC1812P
IC10	Dual 4-input Nand Gate	2025-0008	T.I.	2N7420N
IC11	Monostable, MC8601P	2025-0053	Motorola	MC8601P
IC12	TTL Nand Gate, 2N7400N	2025-0003	T.I.	SN7400N
IC13	Monostable, MC8601P	2025-0053	Motorola	MC8601P
IC14	TTL Nand Gate, 2N7400N	2025-0003	T.I.	SN7400N
IC15	TTL Nand Gate, 2N7400N	2025-0003	T.I.	SN7400N
	RESISTORS			
R1	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R2	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R3	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R4	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R5	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R6	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R7	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R8	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R9	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R10	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R11	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R12	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R13	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R14	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R15	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R16	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R17	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R18	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325



TYPE
MC1812P
SN7420N
MC8601P
SN7400N
MC8601P
SN7400N
SN7400N

Figure 6-26. 100 Hz Divide-by-N. 4100





NOTE:

1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

IC NO.	TYPE	IC NO.	TYPE
1	SN7490N	9	MC1812P
2	SN7490N	10	SN7420N
3	SN7490N	11	MC8601P
4	SN7490N	12	SN7400N
5	SN7472N	13	MC8601P
6	MC1812P	14	SN7400N
7	MC1812P	15	SN7400N
8	MC1812P		

Figure 6-26. 100 Hz Divide-by-N. 4100

100 Hz VOLTAGE CONTROLLED OSCILLATOR. 4300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4300	Osc, Voltage Controlled, 100 Hz			
	P.C. Board Assy	7001-0162	Cushman	
	P.C. Board	1780-0294	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Poly, .027μF, ±10%, 100V	1008-0032	Sprague	225P27391
C10	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C11	Poly, .47μF, ±10%, 50V	1008-0038	Electrocube	210B1A474K
C12	Cer, .022μF, ±10%, 100V	1005-0079	Aerovox	CK06BX223K
C13	Mica, 330pF, ±5%, 500V	1002-0032	Elmenco	DM15-F-331J
C14	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C15	Cer, .1μF, ±10%, 100V	1005-0064	Aerovox	CK06BX104K
C16	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C17	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C18	Cer, .1μF, ±10%, 100V	1005-0064	Aerovox	CK06BX104K
C19	Poly, .027μF, ±10%, 100V	1008-0032	Sprague	225P27391
C20	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C21	Cer, .01μF, ±10%, 100V	1005-0065	Aerovox	CK06BX103K
C22	Tant, 22μF, ±10%, 15V	1011-0003	Sprague	150D226X9015B2
C23	Mica, 1000pF, ±5%, 100V	1002-0015	Elmenco	DM15-F-102J
C24	Cer, 33pF, ±2%, 500V	1005-0078	Erie	301-000-U2J0-330G
C25	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C26	Mica, 36pF, ±5%, 500V	1002-0041	Elmenco	DM15-E-360J
C27	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C28	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-221J
C30	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C31	Mica, 51pF, ±5%, 500V	1002-0045	Elmenco	DM15-E-510J
C32	Cer, .01μF, ±10%, 100V	1005-0065	Aerovox	CK06BX103K
C33	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-221J
C34	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C35	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-221J
C36	Mica, 240pF, ±5%, 500V	1002-0030	Elmenco	DM15-F-241J
C37	Cer, 820pF, ±10%, 1000V	1005-0047	Centralab	DD821
C38	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C39	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C40	Cer, .047μF, ±10%, 100V	1005-0055	Aerovox	CK06BX474K
C41	Cer, .047μF, ±10%, 100V	1005-0055	Aerovox	CK06BX474K
C42	Cer, .1μF, ±10%, 100V	1005-0064	Aerovox	CK06BX104K
	COILS			
L1	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L2	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L3	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L4	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L5	Var, .9μH, ±5%, Unshielded	1596-0043	Dale	IDH1041-25

100 Hz VOLTAGE CONTROLLED OSCILLATOR (cont). 4300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
L6	Choke, 1μH, ±10%, Molded	1585-0027	Delevan	1537-12
L7	Choke, 10μH, ±10%, Molded	1585-0016	Delevan	1537-36
L8	Choke, 56μH, ±5%, Molded	1585-0042	Delevan	1537-64
L9	Choke, 33μH, ±5%, Molded	1585-0022	Delevan	1537-52
L10	Choke, 2 1/2 turn, wideband	1586-0003	Ferroxcube	VK20020/4B
L11	Choke, U-250 Ferrite Bead	1586-0004	Ferroxcube	56-590-65/4B
	DIODES			
CR1	Si, Zener, 9.1V, ±5%, 1W	1281-0027	IRC	1N4739A
CR2	Diode, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR3	Zener, 1N4731A	1281-0025	I.R.	1N4731A
CR4	Diode, DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR5	Diode, G633	1282-0005	ITT	G633
CR6	Voltage Variable C	1281-0037	Motorola	MV1650
CR7	Voltage Variable C	1281-0037	Motorola	MV1650
CR8	Diode, G633	1282-0005	ITT	G633
	INTEGRATED CIRCUITS			
IC1IC	Quad 2-input Nor	2025-0019	Signetics	SP380A
IC2	SN74196N, I.C.	2025-0016	T.I.	SN74196N
	RESISTORS			
R1	Comp, 330Ω, ±5%, 1/2W	1067-3315	Allen-Bradley	EB3315
R2	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R3	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R4	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R5	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R6	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R7	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R8	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R9	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R10	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R11	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R12	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R13	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R14	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R15	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R16	Comp, 1 Meg, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R17	Comp, 18k, ±5%, 1/4W	1066-1835	Allen-Bradley	CB1835
R18	Comp, 39k, ±5%, 1/4W	1066-3935	Allen-Bradley	CB3935
R19	Comp, 82k, ±5%, 1/4W	1066-8235	Allen-Bradley	CB8235
R20	Comp, 130k, ±5%, 1/4W	1066-1345	Allen-Bradley	CB1345
R21	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R22	Comp, 150k, ±5%, 1/4W	1066-1545	Allen-Bradley	CB1545
R23	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R24	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R25	Comp, 150k, ±5%, 1/4W	1066-1545	Allen-Bradley	CB1545
R26	Pot, 100k, ±10%, .3W	1215-0018	Weston	522-00HS-100K
R27	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R28	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R29	Comp, 120k, ±5%, 1/4W	1066-1245	Allen-Bradley	CB1245
R30	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035

100 Hz VOLTAGE CONTROLLED OSCILLATOR (cont). 4300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R31	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R32	Comp, 360Ω, ±5%, 1/4W	1066-3615	Allen-Bradley	CB3615
R33	Comp, 7.5k, ±5%, 1/4W	1066-7525	Allen-Bradley	CB7525
R34	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R35	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R36	Comp, 360Ω, ±5%, 1/4W	1066-3615	Allen-Bradley	CB3615
R37	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R38	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R39	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R40	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R41	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R42	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R43	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R44	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R45	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R46	Comp, 150k, ±5%, 1/4W	1066-1545	Allen-Bradley	CB1545
R47	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R48	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R49	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R50	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R51	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R52	Comp, 150k, ±5%, 1/4W	1066-1545	Allen-Bradley	CB1545
R53	Pot, 100k, ±10%, 3/4W	1215-0006	Helitrim	89 WR
R54	Comp, 39k, ±5%, 1/4W	1066-3935	Allen-Bradley	CB3935
R55	Comp, 13k, ±5%, 1/4W	1066-1335	Allen-Bradley	CB1335
R56	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R57	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R58	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R59	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R60	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R61	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R62	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R63	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R64	Comp, 180Ω, ±5%, 1/4W	1066-1815	Allen-Bradley	CB1815
R65	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R66	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R67	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R68	Comp, 22Ω, ±5%, 1/4W	1066-2205	Allen-Bradley	CB2205
R69	Comp, 180Ω, ±5%, 1/4W	1066-1815	Allen-Bradley	CB1815
R70	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R71	Comp, 390Ω, ±5%, 1/4W	1066-3915	Allen-Bradley	CB3915
R72	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R73	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R74	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R75	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R76	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R77	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215

100 Hz VOLTAGE CONTROLLED OSCILLATOR (cont). 4300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q2	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q3	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q4	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q5	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q6	FET, P-Channel, 2N4342	1272-0027	Fairchild	2N4342
Q7	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q8	FET, N-Channel, 2N4092	1272-0025	Teledyne	2N4092
Q9	Si, NPN, 2N5089	1272-0031	Motorola	2N5089
Q10	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q11	Si, NPN, 2N5089	1272-0031	Motorola	2N5089
Q12	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q13	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q14	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q15	FET, P-Channel, 2N4342	1272-0027	Fairchild	2N4342
Q16	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q17	FET, N-Channel, 2N5555	1272-0062	Motorola	2N5555
Q18	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q19	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q20	Si, NPN, 2N5179	1272-0060	Motorla	2N5179
Q21	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q22	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q23	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q24	FET, N-Channel Planar	1272-0039	T.I.	2N3819

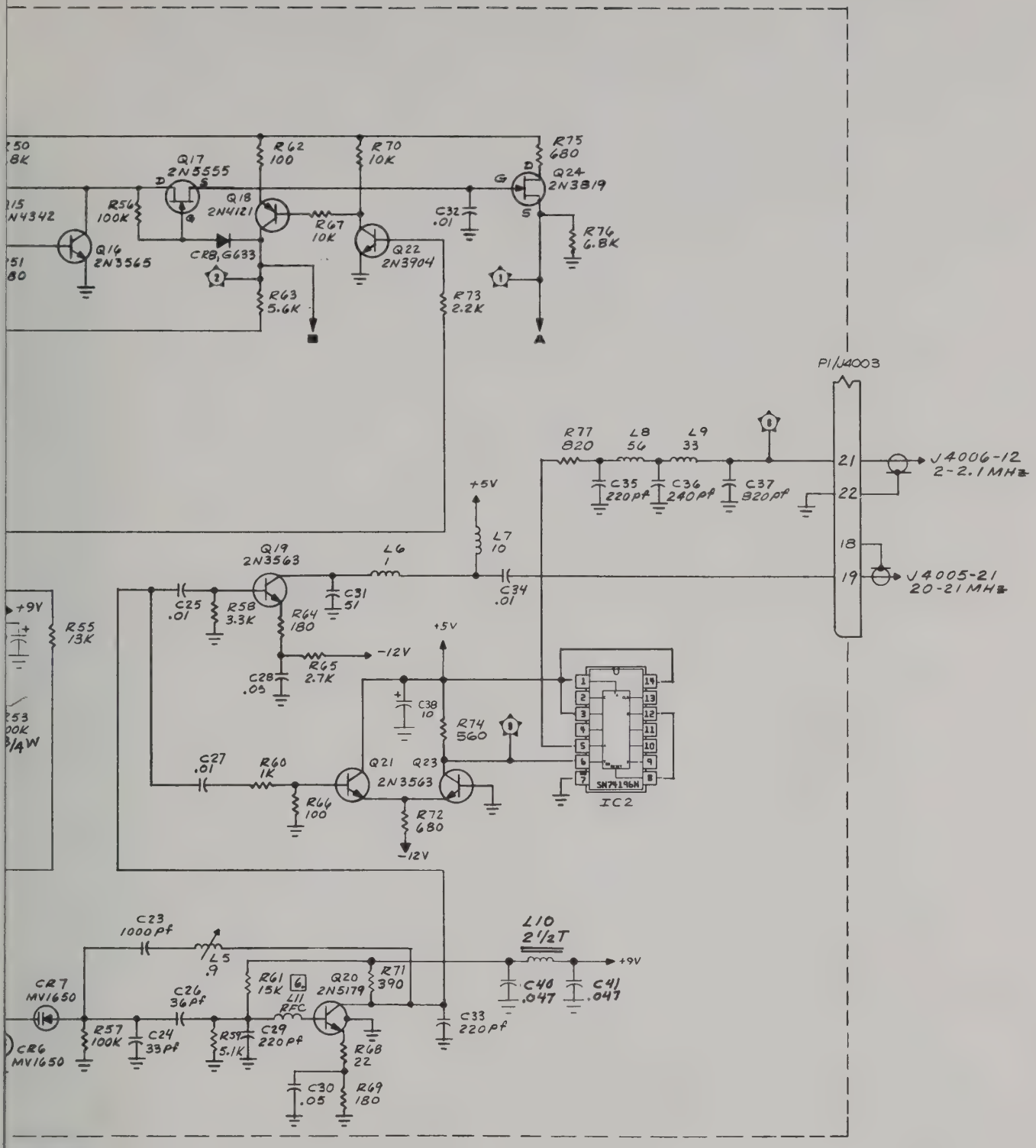
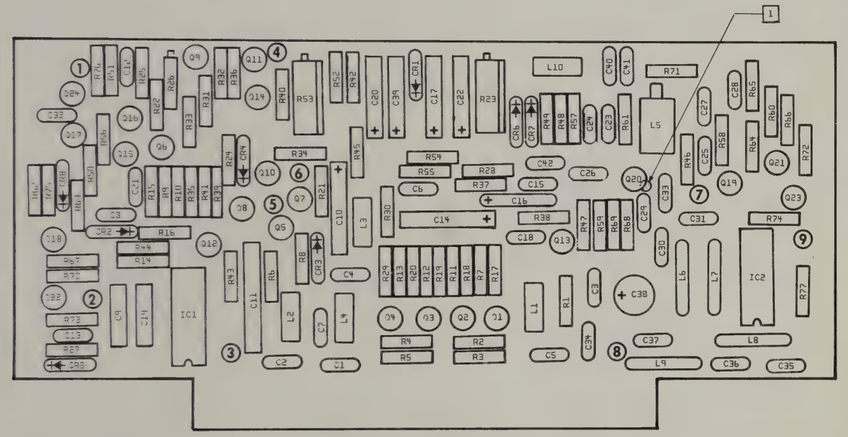


Figure 6-27. 100 Hz Voltage Controlled Oscillator. 4300

100 Hz VOLTAGE CONTROLLED OSCILLATOR (cont). 4300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q2	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q3	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q4	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q5	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q6	FET, P-Channel, 2N4342	1272-0027	Fairchild	2N4342
Q7	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q8	FET, N-Channel, 2N4092	1272-0025	Teledyne	2N4092
Q9	Si, NPN, 2N5089	1272-0031	Motorola	2N5089
Q10	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q11	Si, NPN, 2N5089	1272-0031	Motorola	2N5089
Q12	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q13	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q14	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q15	FET, P-Channel, 2N4342	1272-0027	Fairchild	2N4342
Q16	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q17	FET, N-Channel, 2N5555	1272-0062	Motorola	2N5555
Q18	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q19	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q20	Si, NPN, 2N5179	1272-0060	Motorla	2N5179
Q21	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q22	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q23	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q24	FET, N-Channel Planar	1272-0039	T.I.	2N3819



NOTE: [1] FERRITE BEAD LOCATED ON BASE LEAD OF Q20.

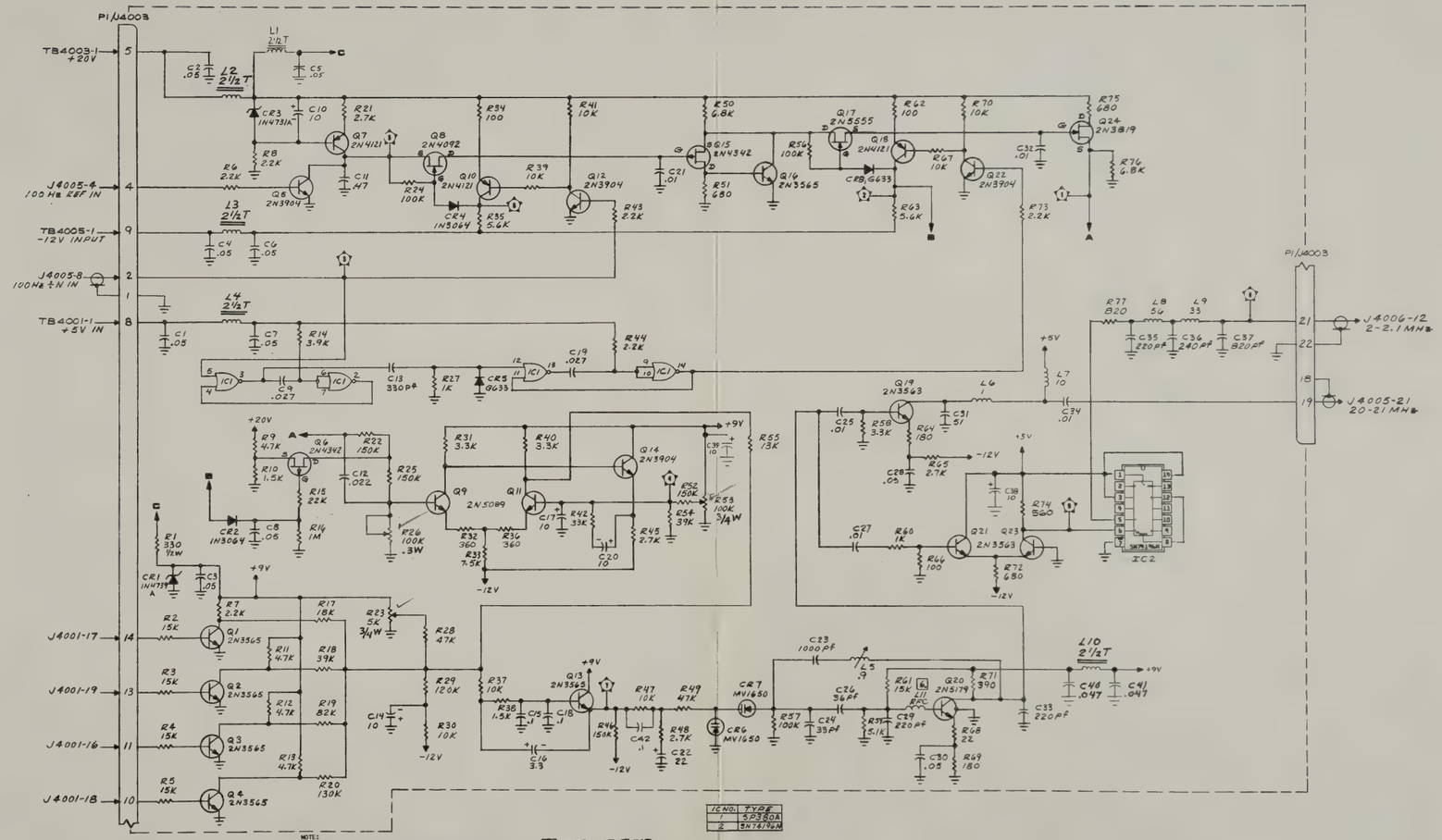


Figure 6-27. 100 Hz Voltage Controlled Oscillator. 4300

10 MHz MODULATOR. 4400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4400	Modulator, 10 MHz			
	P.C. Board Assy	7001-0163	Cushman	
	P.C. Board	1780-0310	Cushman	
	CAPACITORS			
C1	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C2	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C3	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C4	Poly, .027μF, ±10%, 100V	1008-0032	Sprague	225P27391
C5	Mylar, 1.0μF, ±10%, 100V	1008-0033	TRW	X663F
C6	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C7	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491
C8	Poly, .01μF, ±10%, 200V	1008-0043	Sprague	225P10392XA3
C9	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C10	Cer Tub, 22pF, ±2%, 500V	1005-0007	Erie	301-000-U2J0-220G
C11	Mica, 22pF, ±5%, 500V	1002-0023	Elmenco	DM15-C-220J
C12	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491
C13	Poly, .01μF, ±10%, 200V	1008-0043	Sprague	225P10392XA3
C14	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C15	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C16	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C17	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C18	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C19	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C20	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C21	Mica, 390pF, ±5%, 500V	1002-0033	Elmenco	DM15-F-391J
C22	Mica, 39pF, ±5%, 500V	1002-0018	Elmenco	DM15-E-390J
C23	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C24	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C25	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C26	Mica, 120pF, ±5%, 500V	1002-0010	Elmenco	DM15-F-121J
	COILS			
L1	Choke, 82μH, ±5%, Molded	1585-0032	Delevan	1537-72
L2	Choke, 82μH, ±5%, Molded	1585-0032	Delevan	1537-72
L3	Var, 3.8-7.3μH	1596-0025	Delevan	4000-18
L4	Var, .5-.75μH, 8 turns	1596-0011	Cushman	
L5	Choke, 82μH, ±5%, Molded	1585-0032	Delevan	1537-72
	DIODES			
CR1	Varicap, 33pF, ±20%	1281-0010	TRW	V33
CR2	Silicon junction, 1N816	1281-0009	Transitron	1N816
CR3	Silicon junction, 1N816	1281-0009	Transitron	1N816
	RESISTORS			
R1	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R2	Comp, 2 Meg, ±5%, 1/4W	1066-2055	Allen-Bradley	CB2055
R3	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89 WR
R4	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R5	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89 WR

10 MHz MODULATOR (cont). 4400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R6	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R7	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R8	Comp, 220k, ±5%, 1/4W	1066-2245	Allen-Bradley	CB2245
R9	Comp, 330Ω, ±5%, 1/4W	1066-3315	Allen-Bradley	CB3315
R10	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R11	Comp, 27k, ±5%, 1/4W	1066-2735	Allen-Bradley	CB2735
R12	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R13	Comp, 1.2 Meg, ±5%, 1/4W	1066-1255	Allen-Bradley	CB1255
R14	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R15	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R16	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R17	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R18	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R19	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R20	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R21	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R22	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R23	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R24	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R25	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R26	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R27	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R28	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R29	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R30	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R31	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R32	Comp, 22Ω, ±5%, 1/4W	1066-2205	Allen-Bradley	CB2205
	TRANSISTORS			
Q1	Si, NPN, 2N3642	1272-0018	Fairchild	2N3642
Q2	Si, NPN, 2N3642	1272-0018	Fairchild	2N3642
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q5	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275

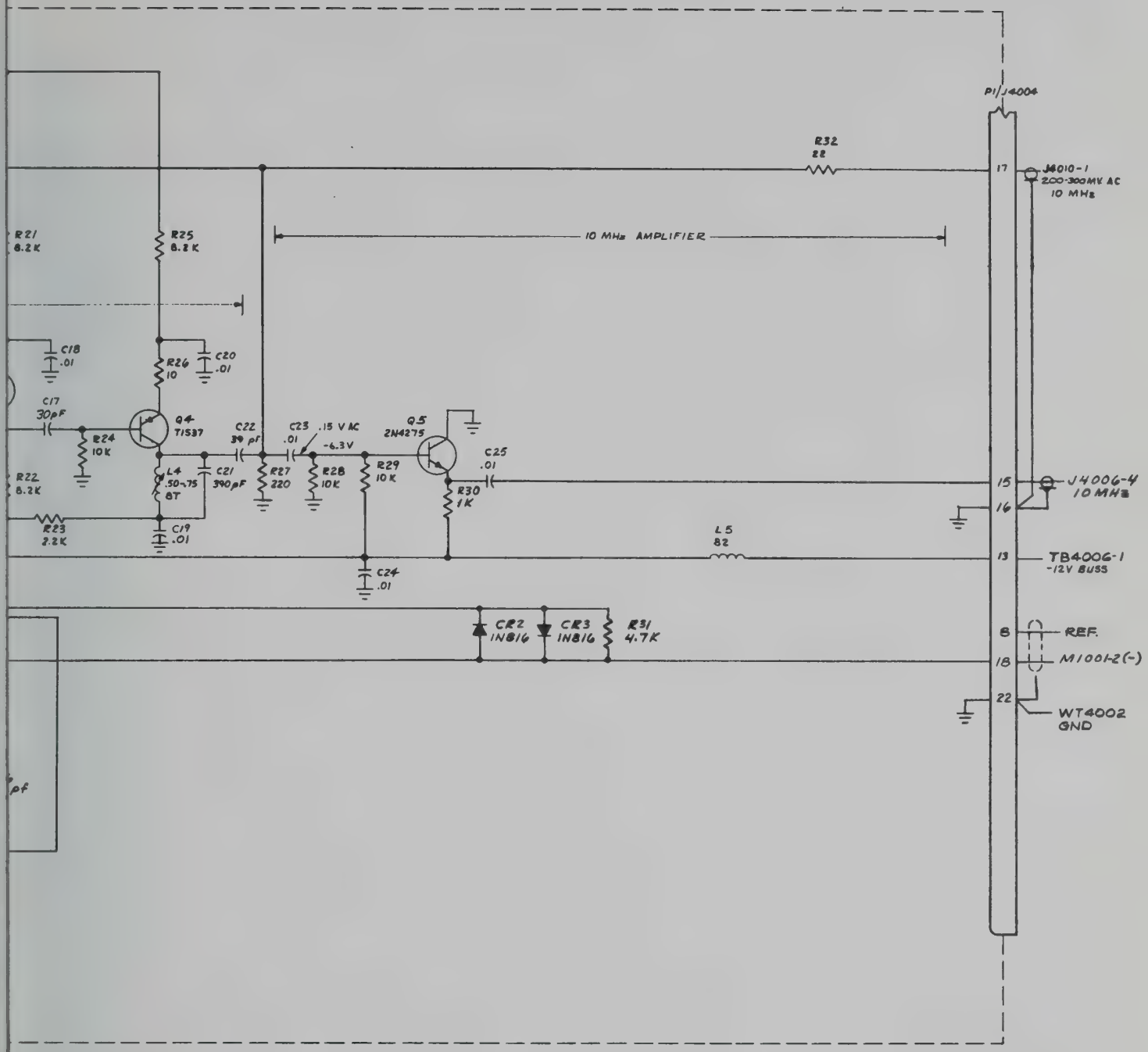
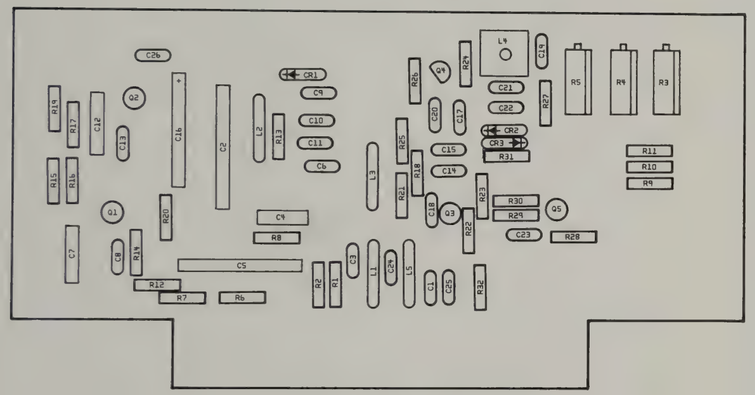


Figure 6-28. 10 MHz Modulator. 4400

10 MHz MODULATOR (cont). 4400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R6	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R7	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R8	Comp, 220k, ±5%, 1/4W	1066-2245	Allen-Bradley	CB2245
R9	Comp, 330Ω, ±5%, 1/4W	1066-3315	Allen-Bradley	CB3315
R10	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R11	Comp, 27k, ±5%, 1/4W	1066-2735	Allen-Bradley	CB2735
R12	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R13	Comp, 1.2 Meg, ±5%, 1/4W	1066-1255	Allen-Bradley	CB1255
R14	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R15	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R16	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R17	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R18	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R19	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R20	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R21	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R22	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R23	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R24	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R25	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R26	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R27	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R28	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R29	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R30	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R31	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R32	Comp, 22Ω, ±5%, 1/4W	1066-2205	Allen-Bradley	CB2205
	TRANSISTORS			
Q1	Si, NPN, 2N3642	1272-0018	Fairchild	2N3642
Q2	Si, NPN, 2N3642	1272-0018	Fairchild	2N3642
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q5	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275



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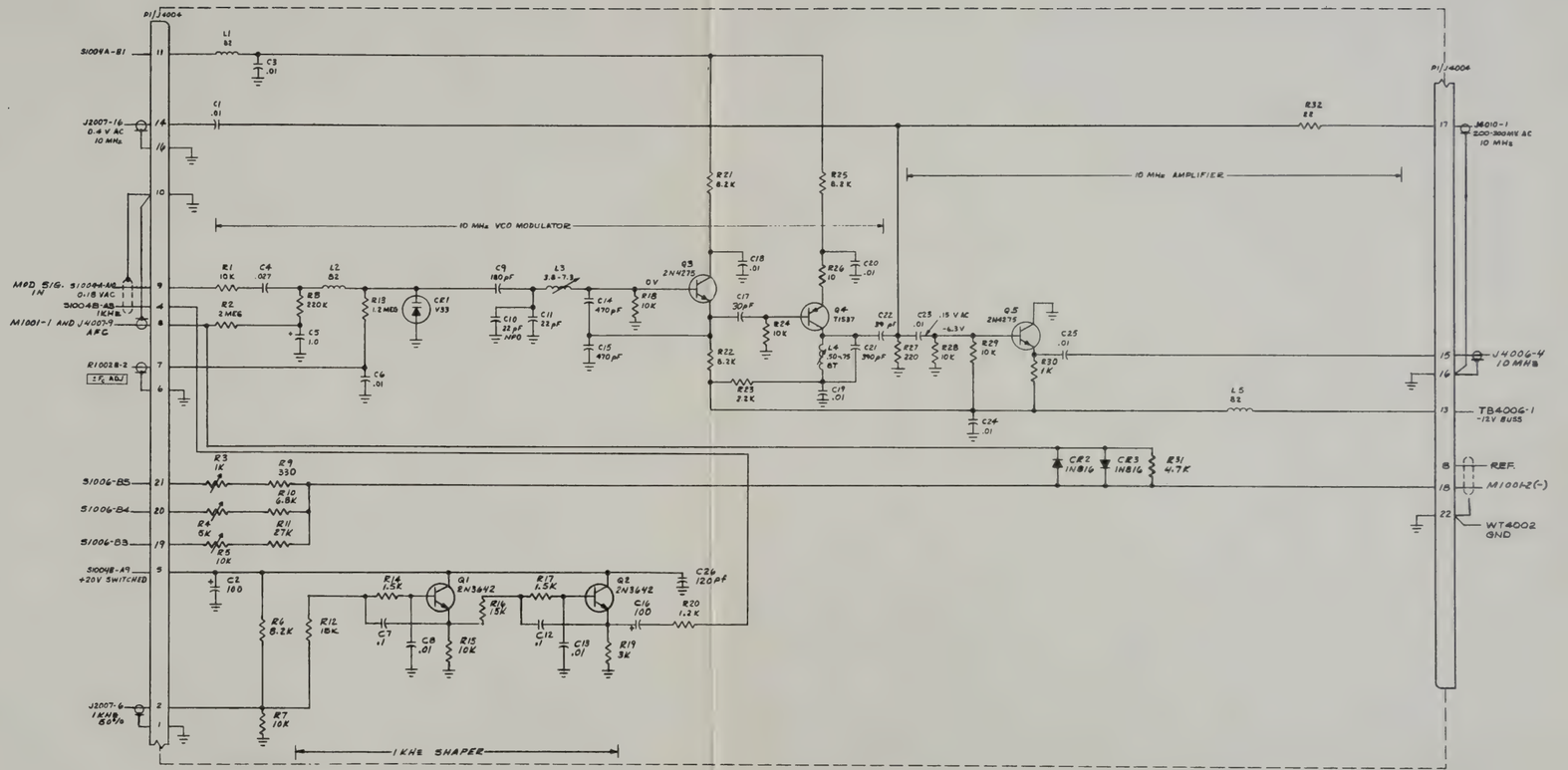


NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-28. 10 MHz Modulator. 4400

100 Hz MULTIPLIER/MIXER. 4500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4500	Multiplier/Mixer, 100 Hz			
	P.C. Board Assy	7001-0164	Cushman	
	P.C. Board	1780-0257	Cushman	
	CAPACITORS			
C1	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C2	Not Used			
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C10	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C11	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C12	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Elect, 1μF, ±10%, 25V	1013-0004	Sprague	30D105G025BA5
C15	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C16	Elect, 25μF, +75-10%, 25V	1013-0010	Sprague	30D256G025CB5
C17	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C18	Elect, 25μF, +75-10%, 25V	1013-0010	Sprague	30D256G025CB5
C19	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C20	Elect, 1μF, ±10%, 25V	1013-0004	Sprague	30D105G025BA5
C21	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491
C22	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491
C25	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C26	Mica, 2000pF, ±5%, 500V	1002-0077	Elmenco	DM19-E-202J
C27	Mica, 2700pF, ±5%, 500V	1002-0081	Elmenco	DM19-C-272J
C28	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C29	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C30	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C31	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C32	Elect, 1μF, ±10%, 25V	1013-0004	Sprague	30D105G025BA5
C33	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C34	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
	COILS			
L1	Choke, 2 1/2 turns, Wideband	1586-0003	Ferroxcube	VK20020/4B
L2	Choke, 2 1/2 turns, Wideband	1586-0003	Ferroxcube	VK20020/4B
L3	Choke, 2 1/2 turns, Wideband	1586-0003	Ferroxcube	VK20020/4B
L4	Choke, 2 1/2 turns, Wideband	1586-0003	Ferroxcube	VK20020/4B
L5	Choke, 15μH, ±10%, molded	1585-0034	Delevan	1437-40
L6	Choke, 2 1/2 turns, Wideband	1586-0003	Ferroxcube	VK20020/4B
L7	Choke, 100μH, ±5%, molded	1585-0017	Delevan	1537-76
L8	Choke, 100μH, ±5%, molded	1585-0017	Delevan	1537-76
L9	Choke, 5.6μH, ±10%, molded	1585-0028	Delevan	1537-30
L10	Choke, 5.6μH, ±10%, molded	1585-0028	Delevan	1537-30
L11	Choke, 3.3μH, ±10%, molded	1585-0037	Delevan	1537-24

100 Hz MULTIPLIER/MIXER (cont). 4500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	DIODES			
CR1	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR2	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR3	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR4	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR5	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR6	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	INTEGRATED CIRCUITS			
IC1	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC2	TTL Nand Gates	2025-0003	T.I.	SN7400N
IC3	High Performance Op-Ampl	2025-0022	T.I.	SN72741N
IC4	Quad 2-input Nor	2025-0019	Signetics	SP380A
	RESISTORS			
R1	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R2	Comp, 27k, ±5%, 1/4W	1066-2735	Allen-Bradley	CB2735
R3	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R4	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R5	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R6	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R7	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R8	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R9	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R10	Pot, 100k, ±10%, 3/4W	1215-0006	Helitrim	89 WR
R11	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R12	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R13	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R14	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R15	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R16	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R17	Comp, 120k, ±5%, 1/4W	1066-1245	Allen-Bradley	CB1245
R18	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R19	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
	TRANSFORMER			
T1	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
T2	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
T3	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q5	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q6	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563

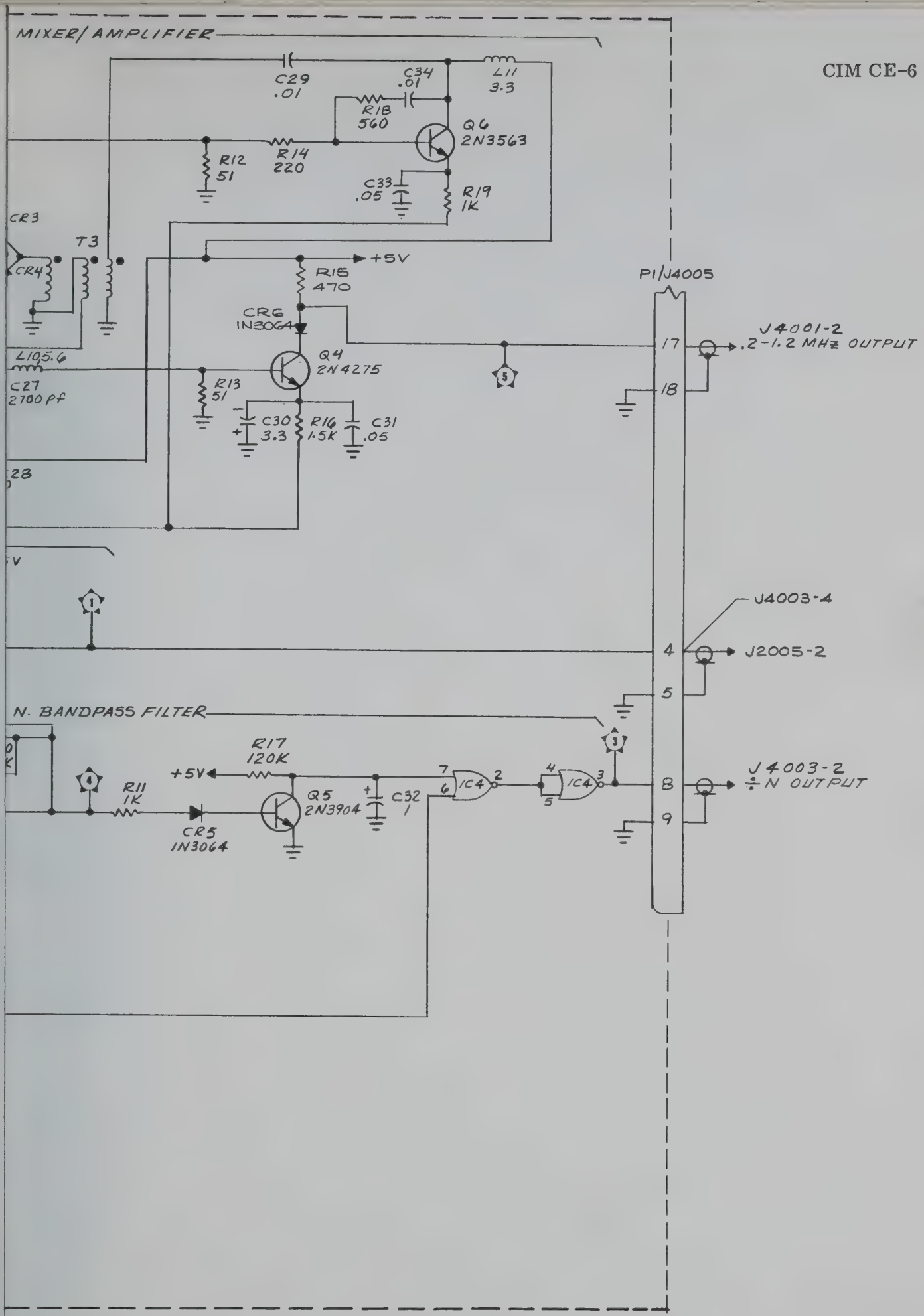
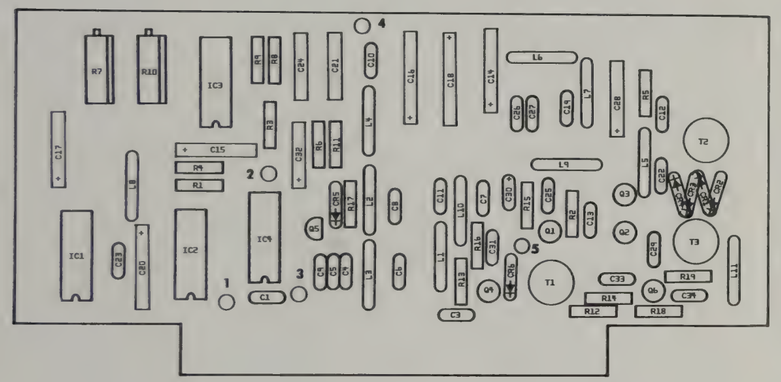


Figure 6-29. 100 Hz Multiplier/Mixer. 4500

100 Hz MULTIPLIER/MIXER (cont). 4500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	DIODES			
CR1	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR2	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR3	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR4	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR5	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR6	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	INTEGRATED CIRCUITS			
IC1	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC2	TTL Nand Gates	2025-0003	T.I.	SN7400N
IC3	High Performance Op-Ampl	2025-0022	T.I.	SN72741N
IC4	Quad 2-input Nor	2025-0019	Signetics	SP380A
	RESISTORS			
R1	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R2	Comp, 27k, ±5%, 1/4W	1066-2735	Allen-Bradley	CB2735
R3	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R4	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R5	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R6	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R7	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89 WR
R8	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R9	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R10	Pot, 100k, ±10%, 3/4W	1215-0006	Helitrim	89 WR
R11	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R12	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R13	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R14	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R15	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R16	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R17	Comp, 120k, ±5%, 1/4W	1066-1245	Allen-Bradley	CB1245
R18	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R19	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
	TRANSFORMER			
T1	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
T2	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
T3	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q5	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q6	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563



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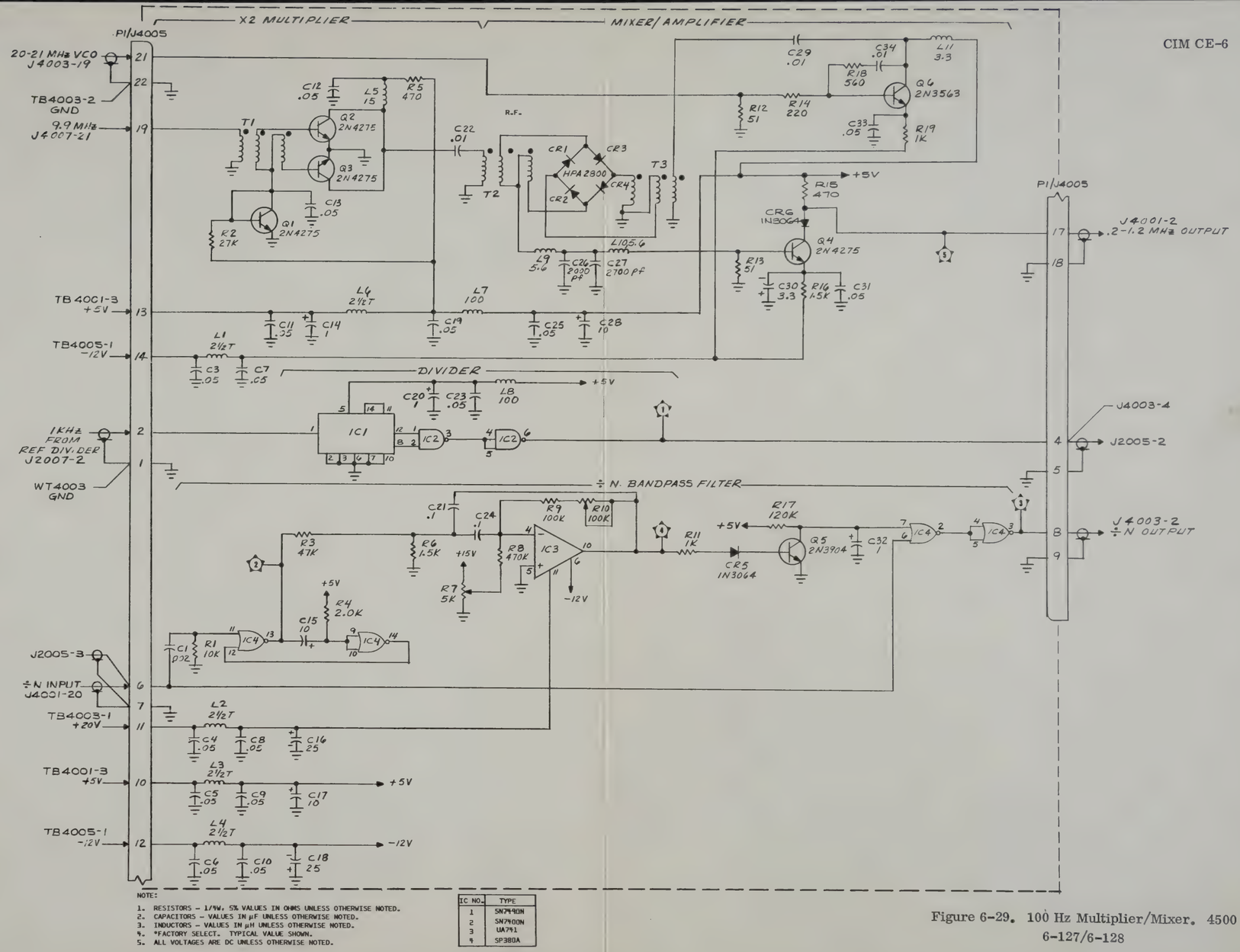


NOTE:

1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

IC NO.	TYPE
1	SN7490N
2	SN7400N
3	UA791
4	SP380A

Figure 6-29. 100 Hz Multiplier/Mixer. 4500

17.9 MHz - 19 MHz MIXER. 4600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4600	Mixer, 17.9-19 MHz			
	P.C. Board Assy	7001-0165	Cushman	
	P.C. Board	1780-0264	Cushman	
	CAPACITORS			
C1	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Mica, 15pF, ±5%, 500V	1002-0001	Elmenco	DM15-C-150J
C8	Cer, 2.2pF, ±.25pF, 500V	1005-0017	Erie	301-000-C0J0-229C
C9	Mica, 96pF, ±1%, 500V	1002-0049	Elmenco	DM15-F-960F
C10	Cer, 1.5pF, ±.25pF, 500V	1005-0041	Erie	301-000-C0K0-159C
C11	Mica, 110pF, ±5%, 500V	1002-0026	Elmenco	DM14-F-111J
C12	Mica, 330pF, ±5%, 500V	1002-0032	Elmenco	DM15-F-331J
C13	Cer, 2-8pF, 350V	1001-0010	Erie	538-006A (2-8)
C14	Mica, 5pF, ±.5pF, 500V	1002-0028	Elmenco	DM15-C-050D
C15	Not Used			
C16	Cer, 2.2pF, ±.25pF, 500V	1005-0017	Erie	301-000-C0J0-229C
C17	Mica, 110pF, ±5%, 500V	1002-0026	Elmenco	DM14-F-111J
C18	Poly, .0022μF, ±10%, 100V	1008-0020	Sprague	225P22291WA3
C19	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-221J
C20	Mica, 15pF, ±5%, 500V	1002-0001	Elmenco	DM15-C-150J
C21	Mica, 96pF, ±1%, 500V	1002-0049	Elmenco	DM15-F-960F
C22	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C25	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C26	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C27	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C28	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C30	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C31	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C32	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C33	Mica, 20pF, ±5%, 500V	1002-0060	Elmenco	DM15-200J
C34	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C35	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C36	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C37	Mica, 15pF, ±5%, 500V	1002-0001	Elmenco	DM15-C-150J
C38	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C39	Mica, 10pF, ±5%, 500V	1002-0016	Elmenco	DM15-C-100J
C40	Mica, 96pF, ±1%, 500V	1002-0049	Elmenco	DM15-F-960F
C41	Cer, 8.2pF, ±.25pF, 500V	1005-0043	Erie	301-000-C0H0-829C
C42	Mica, 120pF, ±5%, 500V	1002-0010	Elmenco	DM15-F-121J
C43	Cer, 8.2pF, ±.25pF, 500V	1005-0043	Erie	301-000-C0H0-829C
C44	Mica, 120pF, ±5%, 500V	1002-0010	Elmenco	DM15-F-121J
C45	Mica, 10pF, ±5%, 500V	1002-0016	Elmenco	DM15-C-100J

17.9 MHz - 19 MHz MIXER (cont). 4600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C46	Mica, 120pF, ±5%, 500V	1002-0010	Elmenco	DM15-F-121J
C47	Mica, 96pF, ±1%, 500V	1002-0049	Elmenco	DM15-F-960F
C48	Mica, 39pF, ±5%, 500V	1002-0018	Elmenco	DM15-E-390J
C49	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C50	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
	COILS			
L1	Choke, 22μH, ±10%, molded	1585-0012	Delevan	1537-44
L2	Choke, 22μH, ±10%, molded	1585-0012	Delevan	1537-44
L3	Choke, 22μH, ±10%, molded	1585-0012	Delevan	1537-44
L4	Choke, 22μH, ±10%, molded	1585-0012	Delevan	1537-44
L5	Not Used			
L6	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L7	Choke, 22μH, ±10%, molded	1585-0012	Delevan	1537-44
L8	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L9	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L10	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L11	Choke, 120μH, ±5%, molded	1585-0033	Delevan	1537-80
L12	Choke, 1μH, ±10%, molded	1585-0027	Delevan	1537-12
L13	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L14	Choke, 1μH, ±10%, molded	1585-0027	Delevan	1537-12
L15	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L16	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L17	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L18	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L19	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L20	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L21	Var, .3-.7, 16 MHz	1596-0011	Cushman	
L22	Choke, 22μH, ±10%, molded	1585-0012	Delevan	1537-44
	DIODES			
CR1	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR2	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR3	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR4	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR5	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR6	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR7	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR8	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR9	Diode, G633	1282-0005	ITT	G633
CR10	Diode, G633	1282-0005	ITT	G633
CR11	Diode, G633	1282-0005	ITT	G633
CR12	Diode, G633	1282-0005	ITT	G633
	INTEGRATED CIRCUITS			
IC1	TTL Decade Counter	2025-0002	T.I.	2N7490N
	RESISTORS			
R1	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R2	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R3	Comp, 47Ω, ±5%, 1/4W	1066-4705	Allen-Bradley	CB4705
R4	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R5	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225

17.8 MHz - 19 MHz MIXER (cont). 4600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R6	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R7	Pot, 100Ω, ±10%, 3/4W	1215-0010	Helitrim	89 WR
R8	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615
R9	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R10	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R11	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R12	Pot, 100Ω, ±10%, 3/4W	1215-0010	Helitrim	89 WR
R13	Comp, 47Ω, ±5%, 1/4W	1066-4705	Allen-Bradley	CB4705
R14	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R15	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R16	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R17	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R18	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R19	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R20	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R21	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R22	Comp, 820Ω, ±5%, 1/4W	1066-8205	Allen-Bradley	CB8205
R23	Not Used			
R24	Comp, 820Ω, ±5%, 1/4W	1066-8205	Allen-Bradley	CB8205
R25	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
	TRANSFORMERS			
T1	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
T2	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
T3	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
T4	Toroid, Trifilar Coil Assy	1579-0017	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q5	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563

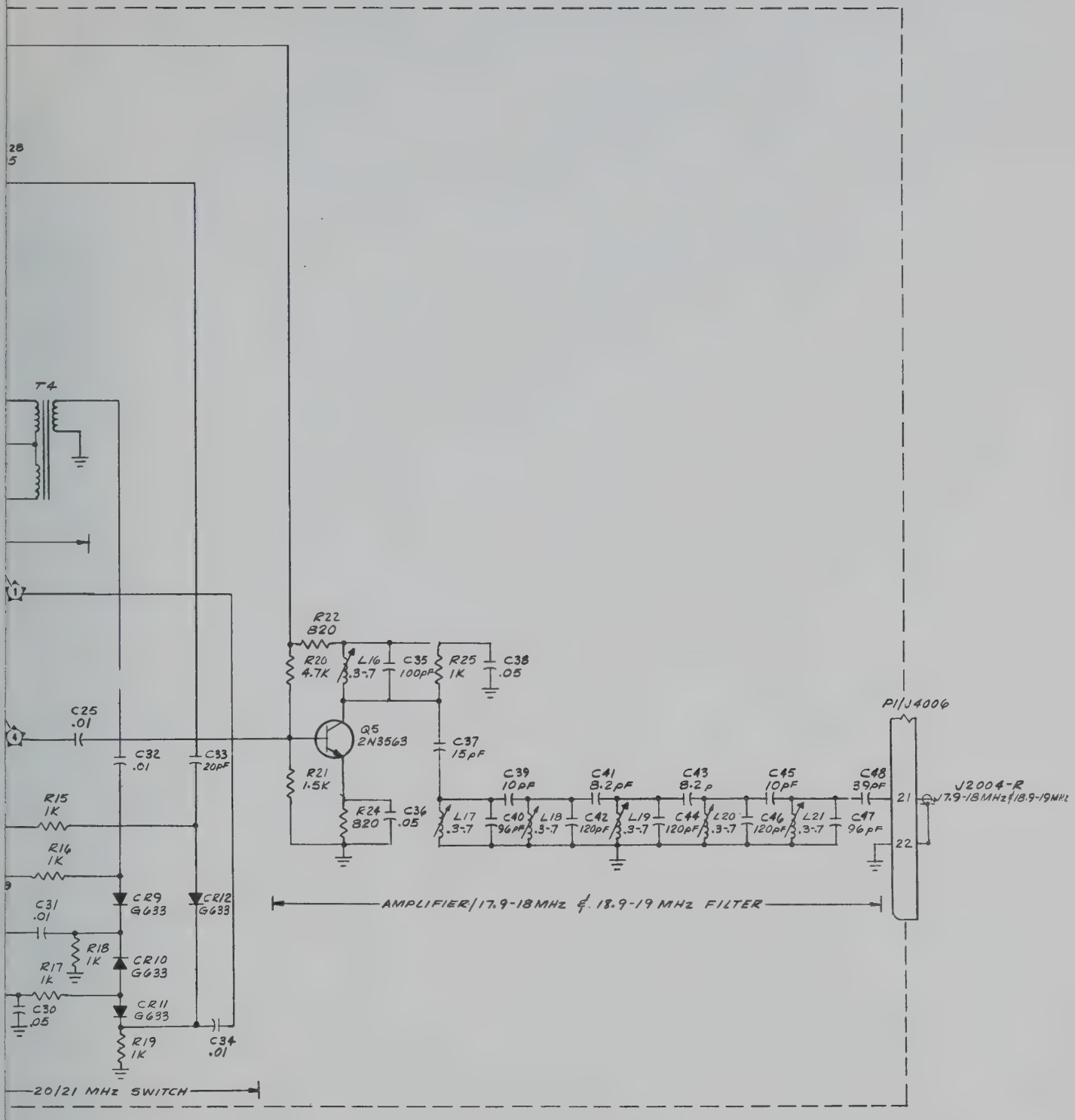
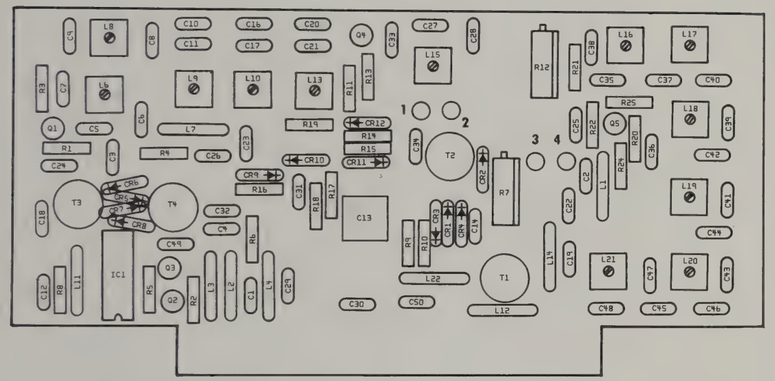
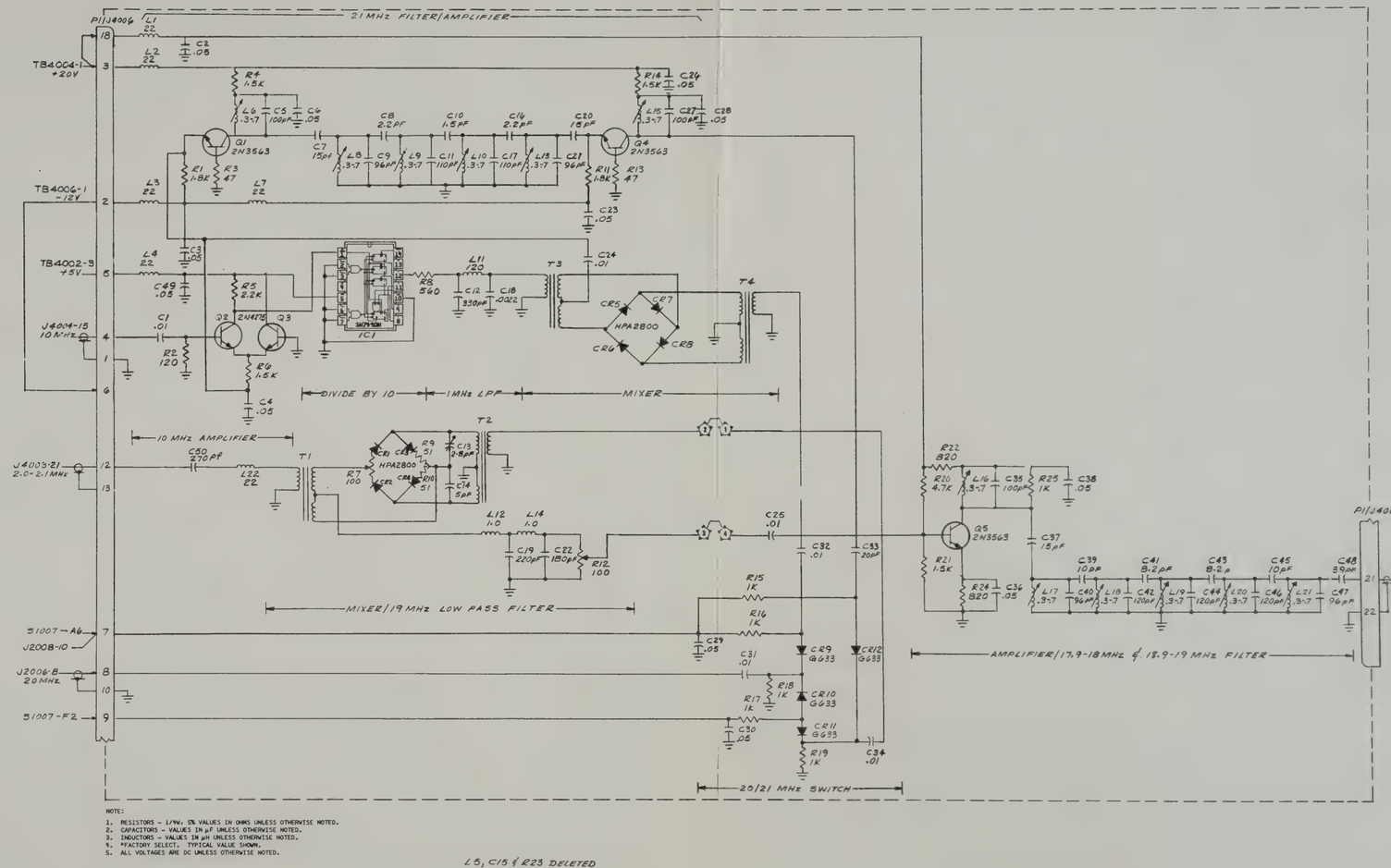


Figure 6-30. 17.9 MHz - 19 MHz Mixer. 4600





NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

5601**0040

Figure 6-30. 17.9 MHz - 19 MHz Mixer. 4600

SECOND I. F./DISCRIMINATOR, 4700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4700	Second I. F./Discriminator			
	P. C. Board Assy	7001-0166	Cushman	
	P. C. Board	1780-0311	Cushman	
	CAPACITORS			
C1	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C2	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C3	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C4	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C5	Elect, 15μF, ±10%, 25V	1013-0005	Sprague	30D156G025BB5
C6	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C7	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Elect, 15μF, +75-10%, 12V	1013-0015	Sprague	30D156G012BA5
C10	Cer, 2.2pF, ±.25pF, 500V	1005-0017	Erie	301-000-C0J0-229C
C11	Mica, 430pF, ±5%, 500V	1002-0034	Elmenco	DM15-F-431J
C12	Mica, 430pF, ±5%, 500V	1002-0034	Elmenco	DM15-F-431J
C13	Cer, 3.3pF, ±.25pF, 500V	1005-0011	Erie	301-000-C0J0-339C
C14	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C15	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U -503Z
C16	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C17	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C18	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C19	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C20	Not Used			
C21	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C22	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C23	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C24	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C25	Poly, .027μF, ±10%, 100V	1008-0032	Sprague	225P27391
C26	Poly, .027μF, ±10%, 100V	1008-0032	Sprague	225P27391
C27	Mica, 2000pF, ±5%, 500V	1002-0077	Elmenco	DM19-E-202J
C28	Poly, .027μF, ±10%, 100V	1008-0032	Sprague	225P27391
C29	Poly, .027μF, ±10%, 100V	1008-0032	Sprague	225P27391
C30	Mica, 470pF, ±1%, 500V	1002-0044	Elmenco	DM15-F-471F
C31	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C32	Elect, 15μF, ±10%, 25V	1013-0005	Sprague	30D156G025BB5
C33	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C34	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C35	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C36	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
	COILS			
L1	Choke, 470μH, ±5%, molded	1585-0019	Delevan	2500-12
L2	Choke, 470μH, ±5%, molded	1585-0019	Delevan	2500-12
L3	Var, 0.5-0.75μH, 8 turns	1596-0011	Cushman	
L4	Var, 0.5-0.75μH, 8 turns	1596-0011	Cushman	
L5	Choke, 82μH, ±5%, molded	1585-0032	Delevan	1537-72
L6	Choke, 82μH, ±5%, molded	1585-0032	Delevan	1537-72
L7	Choke, 2200μH, ±5%, molded	1585-0030	Delevan	2500-44
L8	Choke, 4700μH, ±5%, molded	1585-0006	Delevan	2500-60
L9	Choke, 4700μH, ±5%, molded	1585-0006	Delevan	2500-60
L10	Choke, 2200μH, ±5%, molded	1585-0030	Delevan	2500-44
L11	Choke, 22μH, ±15%, molded	1585-0029	Delevan	2534-56
L12	Choke, 22μH, ±15%, molded	1585-0029	Delevan	2534-56

SECOND I.F./DISCRIMINATOR (cont). 4700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	DIODES			
CR1	Diode, G633	1282-0005	ITT	G633
CR2	Diode, G633	1282-0005	ITT	G633
CR3	Diode, G633	1282-0005	ITT	G633
CR4	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR5	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR6	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR7	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR8	Diode, G633	1282-0005	ITT	G633
CR9	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR10	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR11	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	INTEGRATED CIRCUITS			
IC1	RF Ampl, CA3028A	2025-0012	RCA	CA3028A
IC2	RF Ampl, CA3028A	2025-0012	RCA	CA3028A
	RESISTORS			
R1	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R2	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R3	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R4	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R5	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R6	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R7	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R8	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R9	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R10	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R11	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R12	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R13	Comp, 22Ω, ±5%, 1/4W	1066-2205	Allen-Bradley	CB2205
R14	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R15	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R16	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R17	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R18	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R19	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R20	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R21	Comp, 820Ω, ±5%, 1/2W	1067-8215	Allen-Bradley	EB8215
R22	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R23	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R24	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R25	Comp, 22Ω, ±5%, 1/4W	1066-2205	Allen-Bradley	CB2205
R26	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R27	Comp, 150Ω, ±5%, 1/4W	1066-1515	Allen-Bradley	CB1515
R28	Comp, 68Ω, ±5%, 1/4W	1066-6805	Allen-Bradley	CB6805
R29	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R30	Metal Film, 2.21k, ±1%, 1/8W	1075-0010	Dale	MFF 1/8 T1
R31	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF 1/8 T1
R32	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R33	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF 1/8 T1
R34	Metal Film, 2.21k, ±1%, 1/8W	1075-0010	Dale	MFF 1/8 T1
R35	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035

SECOND I.F./DISCRIMINATOR (cont). 4700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R36	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R37	Not Used			
R38	Metal Film, 1k, ±1%, 1/2W	1076-0007	Dale	MFF 1/2 T1
R39	Metal Film, 357Ω, ±1%, 1/2W	1076-0012	Dale	MFF 1/2 T1
R40	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R41	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R42	Metal Film, 475Ω, ±1%, 1/8W	1075-0023	Dale	MFF 1/8 T1
R43	Metal Film, 14.7k, ±1%, 1/4W	1077-0002	Dale	MFF 1/4 T1
R44	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R45	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R46	Metal Film, 1k, ±1%, 1/2W	1076-0007	Dale	MFF 1/2 T1
R47	Metal Film, 274Ω, ±1%, 1/2W	1076-0013	Dale	MFF 1/2 T1
R48	Comp, 1.2k, ±5%, 1/2W	1067-1225	Allen-Bradley	EB1225
R49	Pot, 200Ω, ±10%, 1/4W	1200-0016	Allen-Bradley	FR201U
R50	Comp, 3.3 Meg, ±5%, 1/4W	1066-3355	Allen-Bradley	CB3355
R51	Comp, 20k, ±5%, 1/4W	1066-2035	Allen-Bradley	CB2035
	TRANSISTORS			
Q1	Si, PNP, TIS 37	1271-0003	T.I.	TIS 37
Q2	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q3	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q4	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q5	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q6	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q7	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q8	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q9	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q10	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275

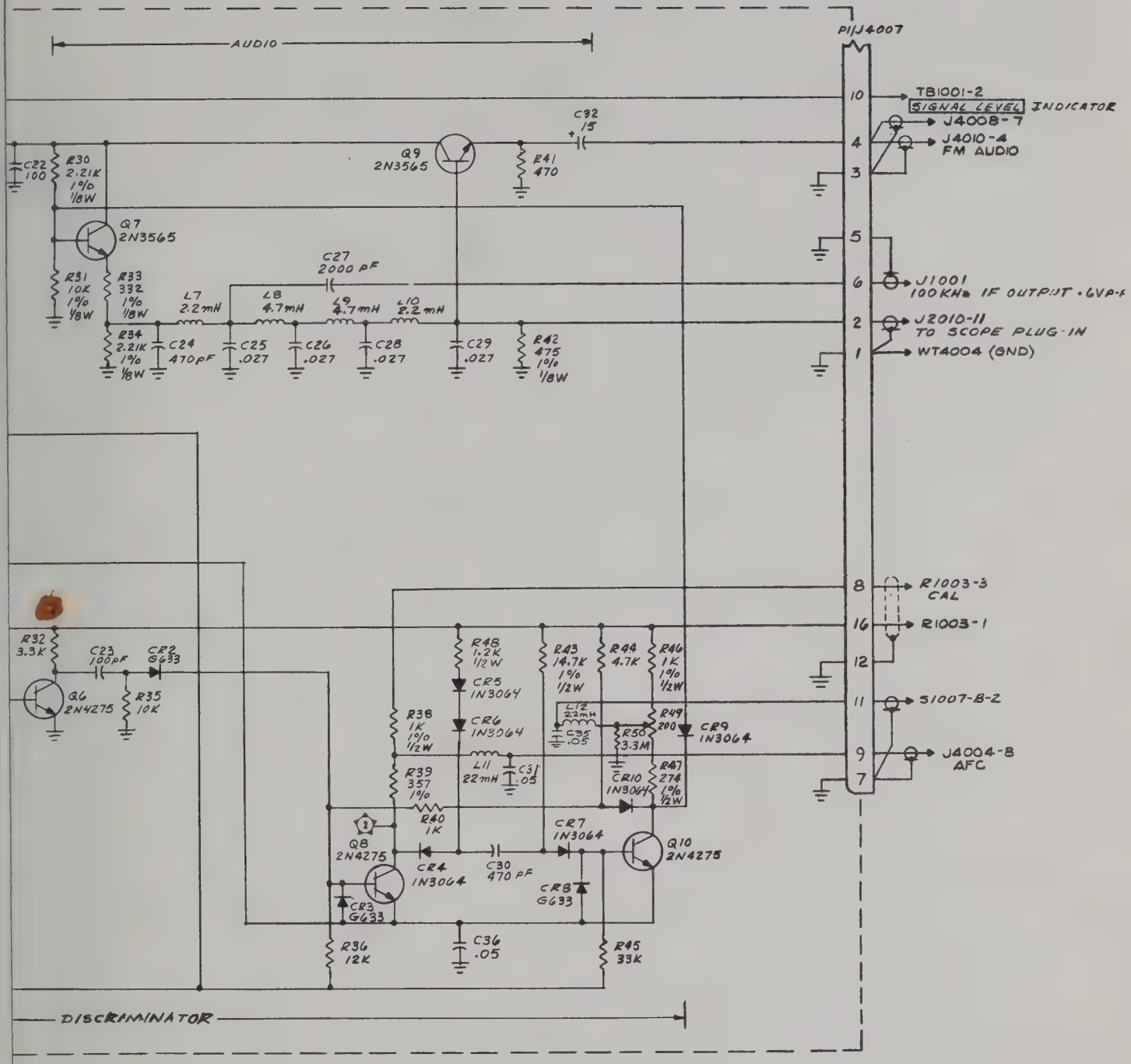
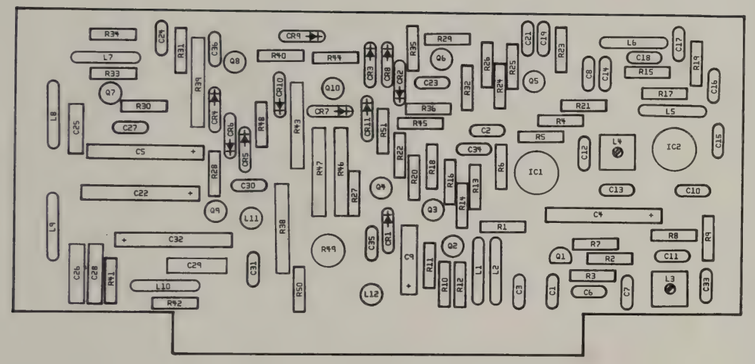
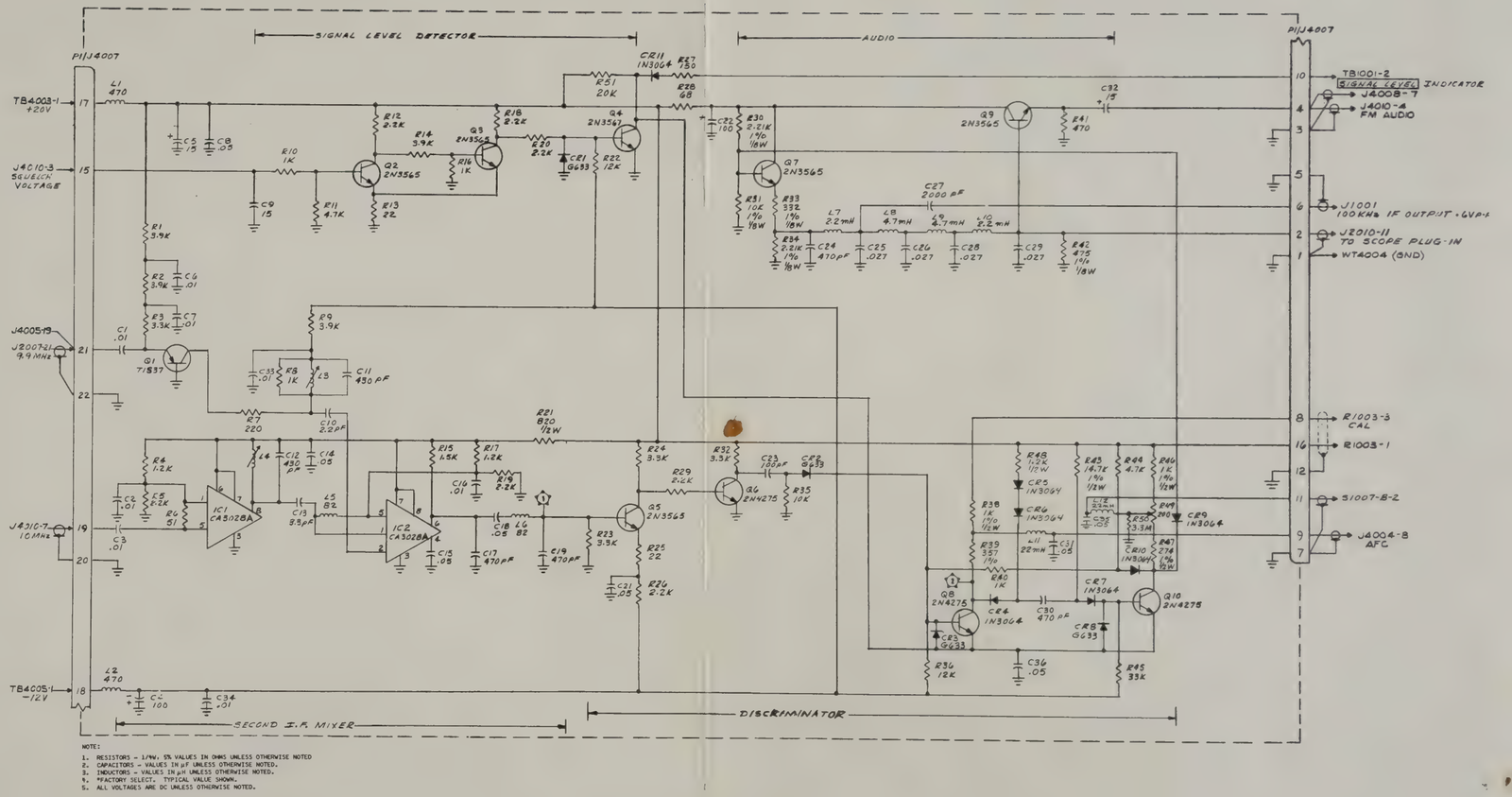


Figure 6-31. Second I.F./Discriminator. 4700





NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

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Figure 6-31. Second I.F./Discriminator. 4700

AMPLIFIER/GENERATOR. 4800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4800	Amplifier/Generator			
	PC Board Assy	7001-0167	Cushman	
	PC Board	1780-0272	Cushman	
	CAPACITORS			
C1	Cer, .1μF, ±20%, 25V	1005-0044	Sprague	5C023104X0250B3
C2	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C3	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C4	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C7	Poly, .0056μF, ±10%, 100V	1008-0022	Sprague	225P56291WA3
C8	Mica, 47pF, ±5%, 500V	1002-0012	Elmenco	DM15-E-470J
C9	Elect, 50μF, 50V	1013-0007	Sprague	30D506G050DD5
C10	Poly, .047μF, ±10%, 100V	1008-0049	Sprague	225P47391WA3
C11	Cer, .1μF, ±10%, 100V	1005-0064	Aerovox	CK06BX104K
C12	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491WA3
C13	Poly, .0022μF, ±10%, 100V	1008-0020	Sprague	225P22291WA3
C14	Cer, .1μF, ±10%, 100V	1005-0064	Aerovox	CK06BX104K
C15	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C16	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C17	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C18	Mica, 330pF, ±5%, 500V	1002-0032	Elmenco	DM15-F-331J
C19	Cer, .1μF, ±10%, 100V	1005-0064	Aerovox	CK06BX104K
C20	Cer, .1μF, ±10%, 100V	1005-0064	Aerovox	CK06BX104K
C21	Poly, .082μF, ±10%, 100V	1008-0023	Sprague	225P82391WA3
C22	Mica, 430pF, ±5%, 500V	1002-0034	Elmenco	DM15-F-431J
C23	Elect, 250μF, +75-10%, 16V	1013-0016	Sprague	30D257G016DF2
C24	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C25	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
	INTEGRATED CIRCUITS			
IC1	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC2	Dual Op Ampl, N5558V	2025-0058	Signetics	N5558V
IC3	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC4	Dual Op Ampl, N5558V	2025-0058	Signetics	N5558V
IC5	Dual Op Ampl, N5558V	2025-0058	Signetics	N5558V
IC6	Audio Power Ampl	2025-0060	Motorola	MFC 6070
	RESISTORS			
R1	Comp, 18k, ±5%, 1/4W	1066-1835	Allen-Bradley	CB1835
R2	Comp, 680k, ±5%, 1/4W	1066-6845	Allen-Bradley	CB6845
R3	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Comp, 820k, ±5%, 1/4W	1066-8245	Allen-Bradley	CB8245
R6	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R7	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R8	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R9	Comp, 9.1k, ±5%, 1/4W	1066-9125	Allen-Bradley	CB9125
R10	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225

AMPLIFIER/GENERATOR (cont). 4800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R12	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R13	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89 WR
R14	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R15	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R16	Comp, 62Ω, ±5%, 1W	1068-6205	Allen-Bradley	GB6205
R17	Comp 1 Meg, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R18	Comp, 180k, ±5%, 1/4W	1066-1845	Allen-Bradley	CB1845
R19	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R20	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R21	Comp, 1 Meg, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R22	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R23	Comp, 820k, ±5%, 1/4W	1066-8245	Allen-Bradley	CB8245
R24	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R25	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R26	Comp, 2 Meg, ±5%, 1/4W	1066-2055	Allen-Bradley	CB2055
R27	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R28	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R29	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R30	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R31	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R32	Comp, 10Ω, ±5%, 1/2W	1067-1005	Allen-Bradley	EB1005
R33	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R34	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R35	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R36	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R37	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615

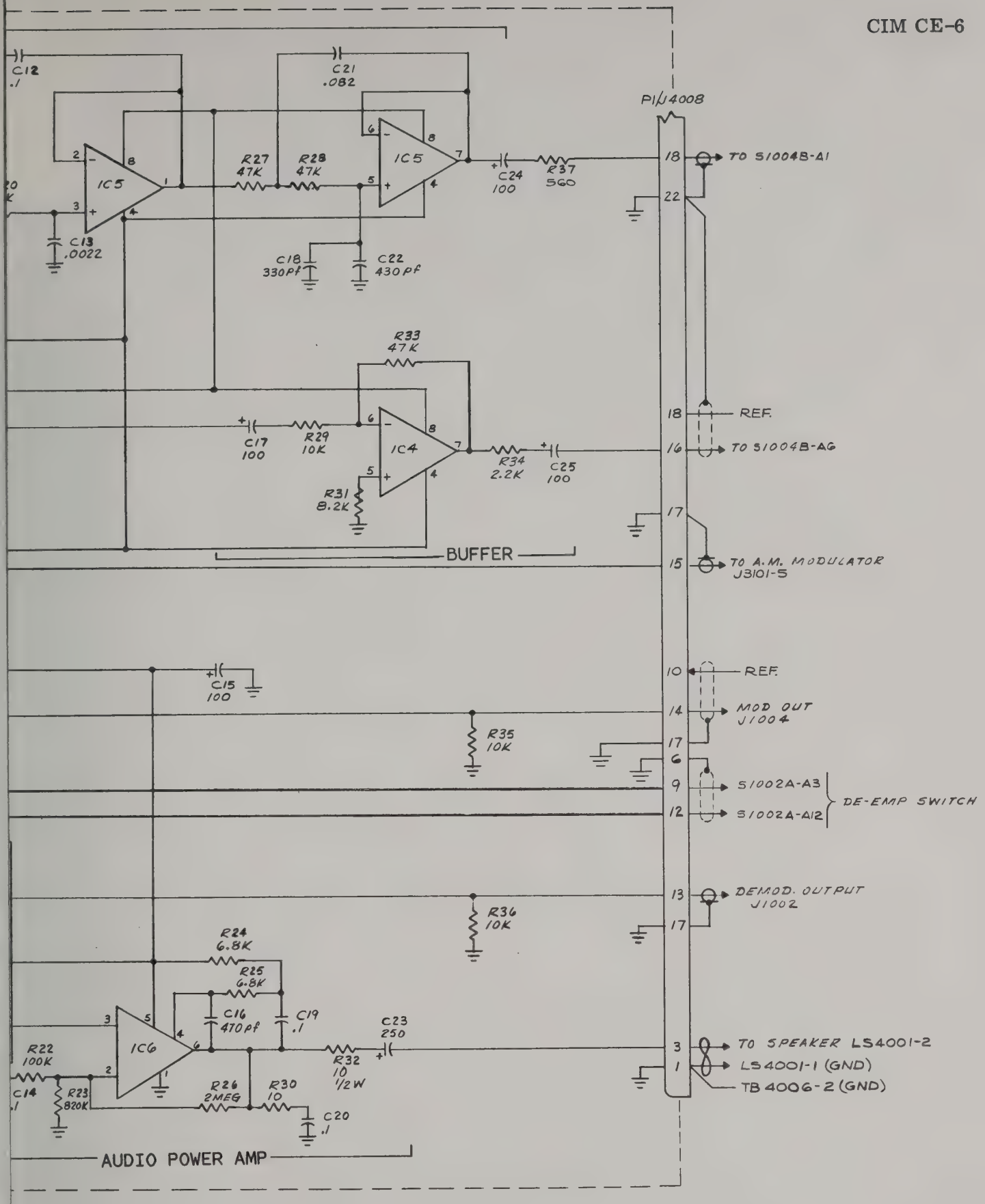
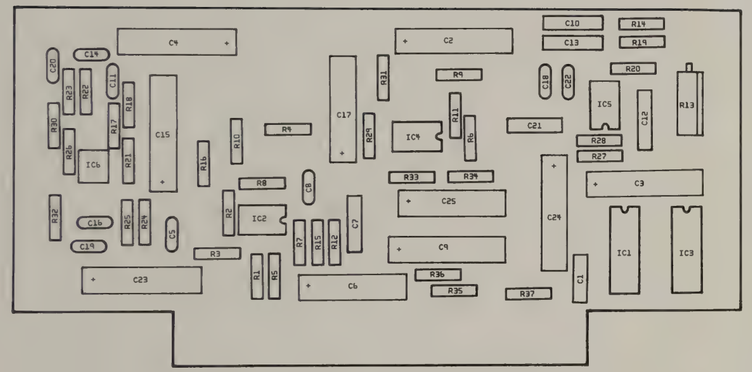


Figure 6-32. Amplifier/Generator. 4800

AMPLIFIER/GENERATOR (cont). 4800

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R12	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R13	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89 WR
R14	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R15	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R16	Comp, 62Ω, ±5%, 1W	1068-6205	Allen-Bradley	GB6205
R17	Comp 1 Meg, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R18	Comp, 180k, ±5%, 1/4W	1066-1845	Allen-Bradley	CB1845
R19	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R20	Comp, 33k, ±5%, 1/4W	1066-3335	Allen-Bradley	CB3335
R21	Comp, 1 Meg, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R22	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R23	Comp, 820k, ±5%, 1/4W	1066-8245	Allen-Bradley	CB8245
R24	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R25	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R26	Comp, 2 Meg, ±5%, 1/4W	1066-2055	Allen-Bradley	CB2055
R27	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R28	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R29	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R30	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R31	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R32	Comp, 10Ω, ±5%, 1/2W	1067-1005	Allen-Bradley	EB1005
R33	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R34	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R35	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R36	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R37	Comp, 560Ω, ±5%, 1/4W	1066-5615	Allen-Bradley	CB5615



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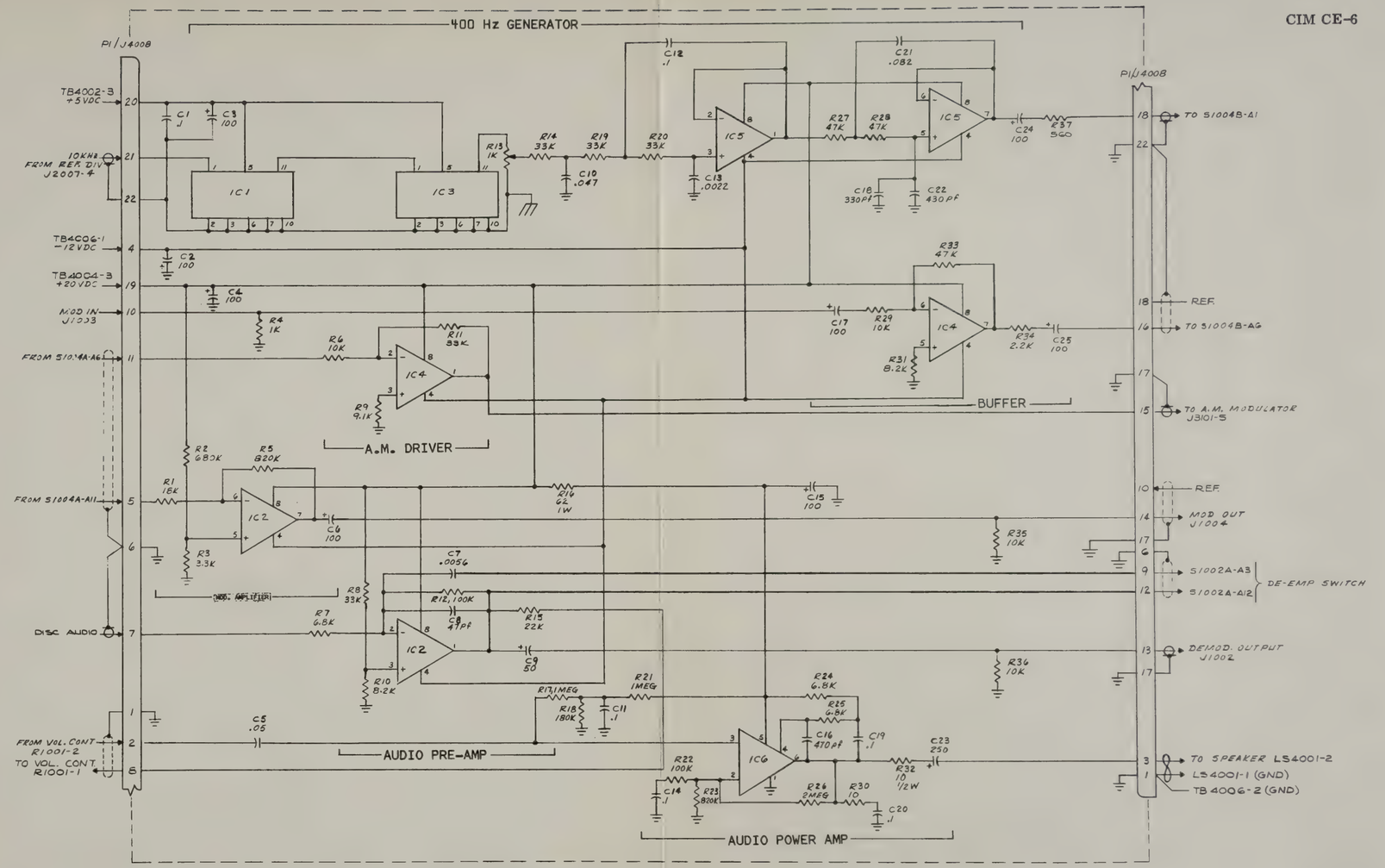


NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

IC NO.	TYPE	TERMINATION		
		+VCC	-VCC	GND
6	MFC6070	PIN 5		PIN 1
2,4,5	NE558V	PIN 8	PIN 4	
1,3	SN7490N	PIN 5		PIN 10

Figure 6-32. Amplifier/Generator. 4800

REAR PANEL. 5000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
5000	Rear Panel Assembly	7003-0052	Cushman	
XF1	Holder, Low Profile fuse	1965-0011	Littlefuse	348-8-9-9
XQ1	Socket, Power Transistor, TO-3	2606-0007	Cinch	2TS-1
XQ2	Socket, Power Transistor, TO-3	2606-0007	Cinch	2TS-1
XQ3	Socket, Power Transistor, TO-3	2606-0007	Cinch	2TS-1
	FUSE			
F1	1 1/2 amp, Slo-Blo	1955-0018	Bussman	AGC 1-1/2 S/B
	TRANSISTORS			
Q1	Si, NPN, 2N3055	1272-0041	RCA	2N3055
Q2	Si, NPN, 2N3055	1272-0041	RCA	2N3055
Q3	Si, NPN, 2N3055	1272-0041	RCA	2N3055
	TRANSFORMER			
T1	Transformer, Power	1575-0019	Cushman	

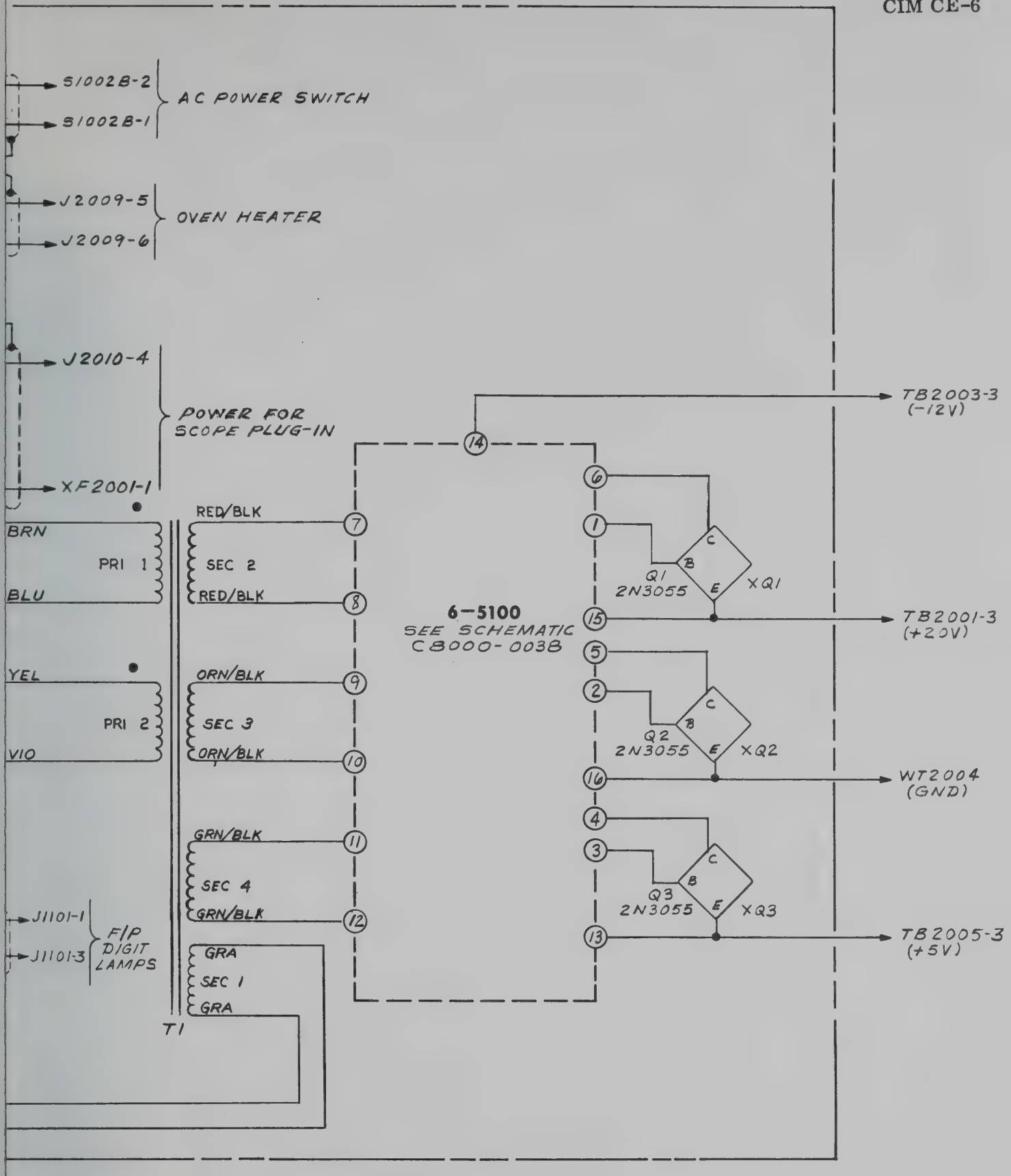
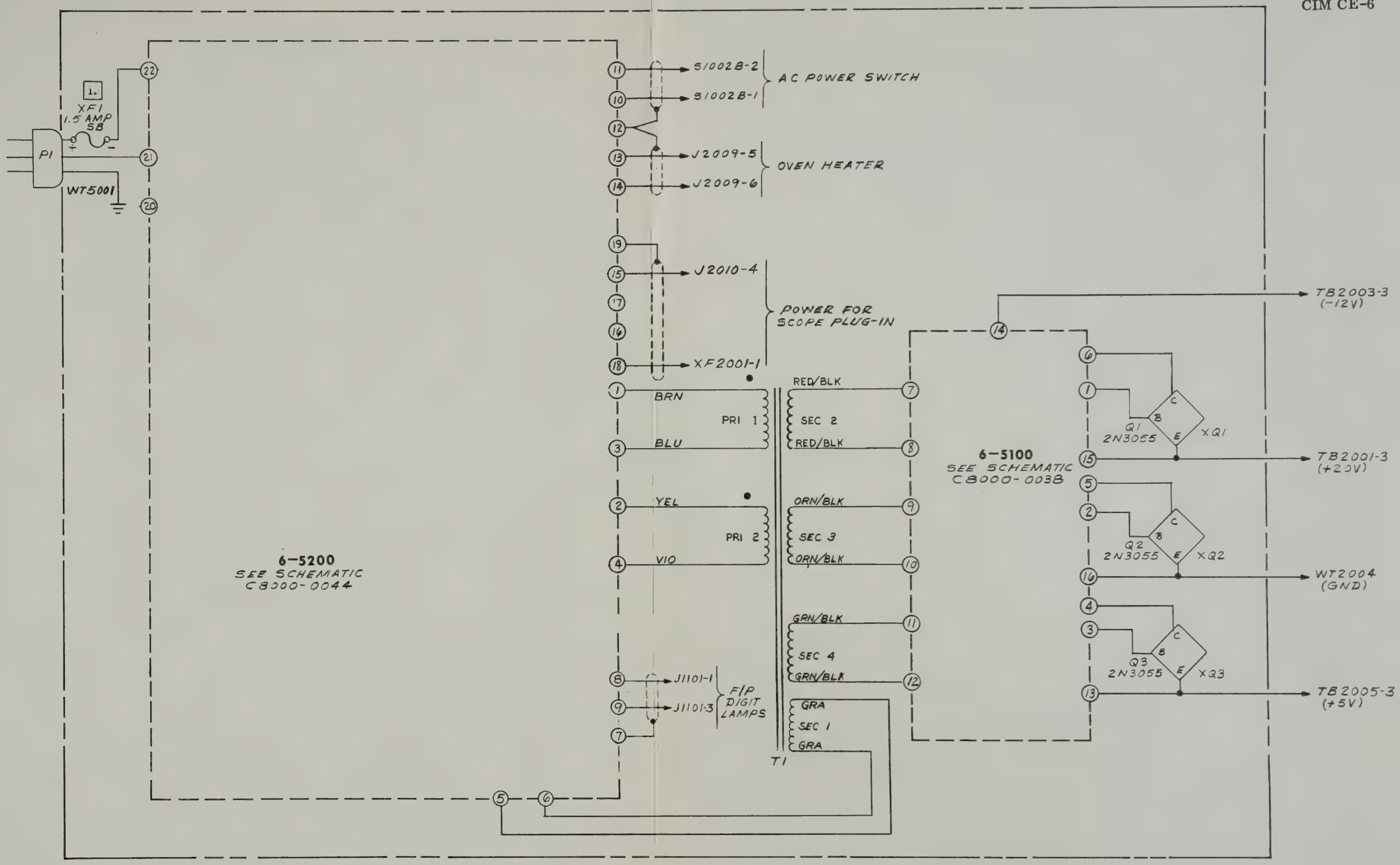


Figure 6-33. Rear Panel Wiring Diagram. 5000



1. POSITIVE AND NEGATIVE SYMBOLS ARE MARKED ON FUSE HOLDER TERMINALS.
2. SEE SCHEMATIC C8000-0044 FOR 115 AND 230 VAC OPERATION.

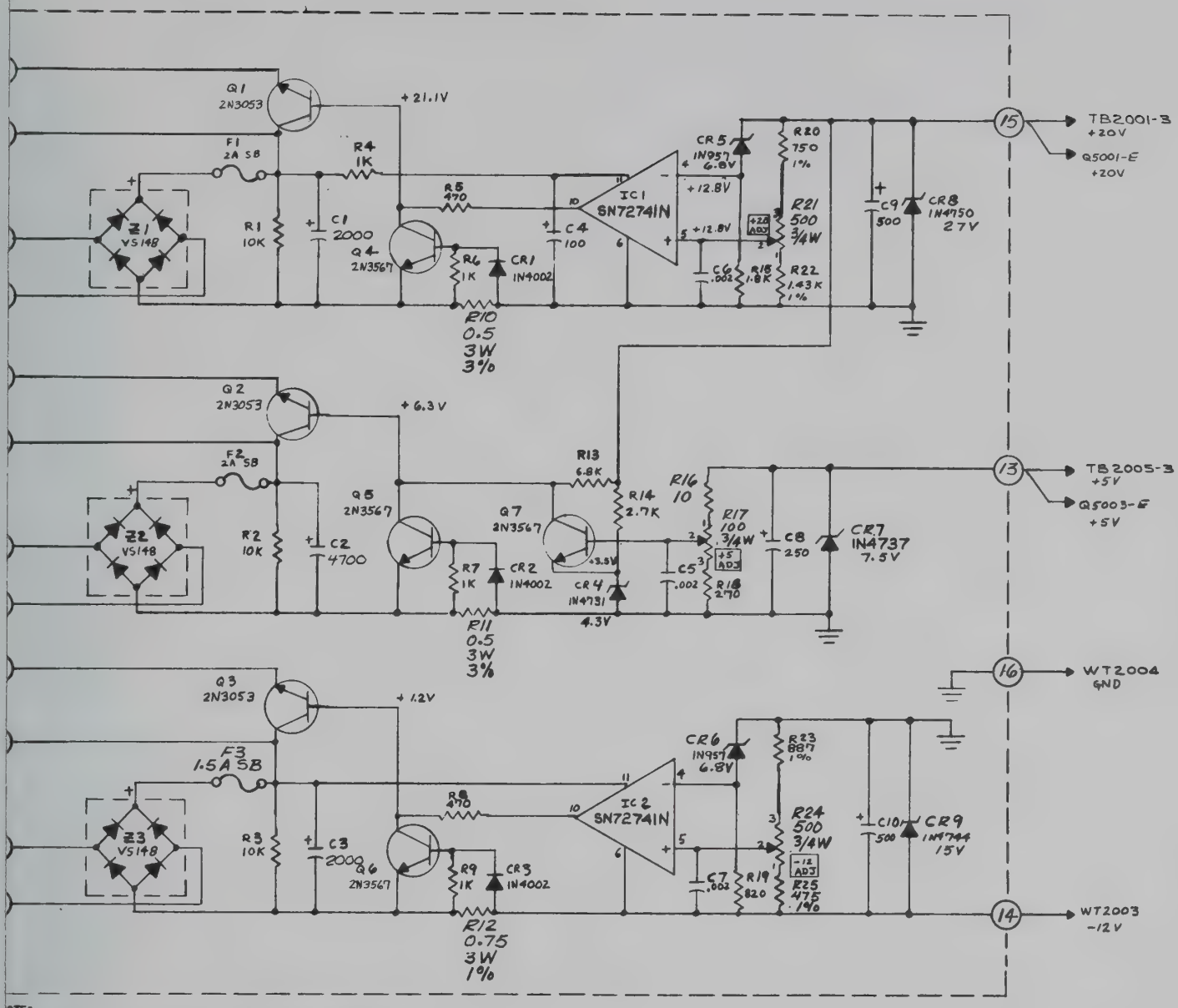
Figure 6-33. Rear Panel Wiring Diagram. 5000

POWER SUPPLY/REGULATOR. 5100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
5100	Power Supply/Regulator PC Board Assy	7001-0168	Cushman	
	PC Board	1780-0288	Cushman	
	CAPACITORS			
C1	Elect, 2000μF, +150-10%, 50V	1014-0015	Illinois Elna	50T2000
C2	Elect, 4700μF, +150-10%, 25V	1014-0017	Illinois Elna	25T4700
C3	Elect, 2000μF, +150-10%, 50V	1014-0015	Illinois Elna	50T2000
C4	Elect, 100μF, +75-10%, 25V	1013-0003	Sprague	30D107G025DD5
C5	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C6	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C7	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C8	Elect, 250μF, +75-10%, 16V	1013-0016	Sprague	30D25yG016DF2
C9	Elect, 500μF, +100-10%, 25V	1014-0002	Illinois Elna	25T500
C10	Elect, 500μF, +100-10%, 25V	1014-0002	Illinois Elna	25T500
	DIODES			
CR1	100V, Piv. Min.	1281-0023	ITT	1N4002
CR2	100V, Piv. Min.	1281-0023	ITT	1N4002
CR3	100V, Piv. Min.	1281-0023	ITT	1N4002
CR4	Zener, 4.3V, 1N4731	1281-0025	I.R.	1N4731
CR5	Zener, 6.8V, 1N957	1281-0007	Motorola	1N957
CR6	Zener, 6.8V, 1N957	1281-0007	Motorola	1N957
CR7	Zener, 7.5V, 1N4737	1281-0026	T.I.	1N4737
CR8	Zener, 27V, 1N4750	1281-0052	Motorola	1N4750
CR9	Si, 15V, ±20%, 1W	1281-0028	Motorola	1N4744
Z1	Diode Bridges, 2 amps	1281-5003	Varo Inc.	VS-148
Z2	Diode Bridges, 2 amps	1281-5003	Varo Inc.	VS-148
Z3	Diode Bridges, 2 amps	1281-5003	Varo Inc.	VS-148
	FUSES			
F1	2 amp, Slo-Blo	1955-0001	Littlefuse	313002
F2	2 amp, Slo-Blo	1955-0001	Littlefuse	313002
F3	1 1/2 amp, Slo-Blo	1955-0018	Bussman	AGC1-1/21S/B
	INTEGRATED CIRCUITS			
IC1	High Performance Op-Ampl	2025-0022	T.I.	SN72741N
IC2	High Performance Op-Ampl	2025-0022	T.I.	SN72741N
	RESISTORS			
R1	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R2	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R3	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R6	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R7	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R8	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R9	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R10	WW, .5Ω, ±3%, 3W	1159-0002	Dale	RS-2B

POWER SUPPLY/REGULATOR (cont). 5100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	WW, .5Ω, ±3%, 3W	1159-0002	Dale	RS-2B
R12	WW, .75Ω, ±1%, 3W	1159-0005	Dale	RS-2B
R13	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R14	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R15	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R16	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R17	Pot, 100Ω, ±10%, 3/4W	1215-0010	Helitrim	89 WR
R18	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R19	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R20	Metal Film, 750Ω, ±1%, 1/8W	1075-0043	Dale	MFF 1/8 T1
R21	Pot, 500Ω, ±10%, 3/4W	1215-0011	Helitrim	89 WR
R22	Metal Film, 1.43k, ±1%, 1/8W	1075-0021	Dale	MFF 1/8 T1
R23	Metal Film, 887Ω, ±1%, 1/8W	1075-0022	Dale	MFF 1/8 T1
R24	Pot, 500Ω, ±10%, 3/4W	1215-0011	Helitrim	89 WR
R25	Metal Film, 475Ω, ±1%, 1/8W	1075-0023	Dale	MFF 1/8 T1
	TRANSISTORS			
Q1	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q2	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q3	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q4	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q5	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q6	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q7	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567



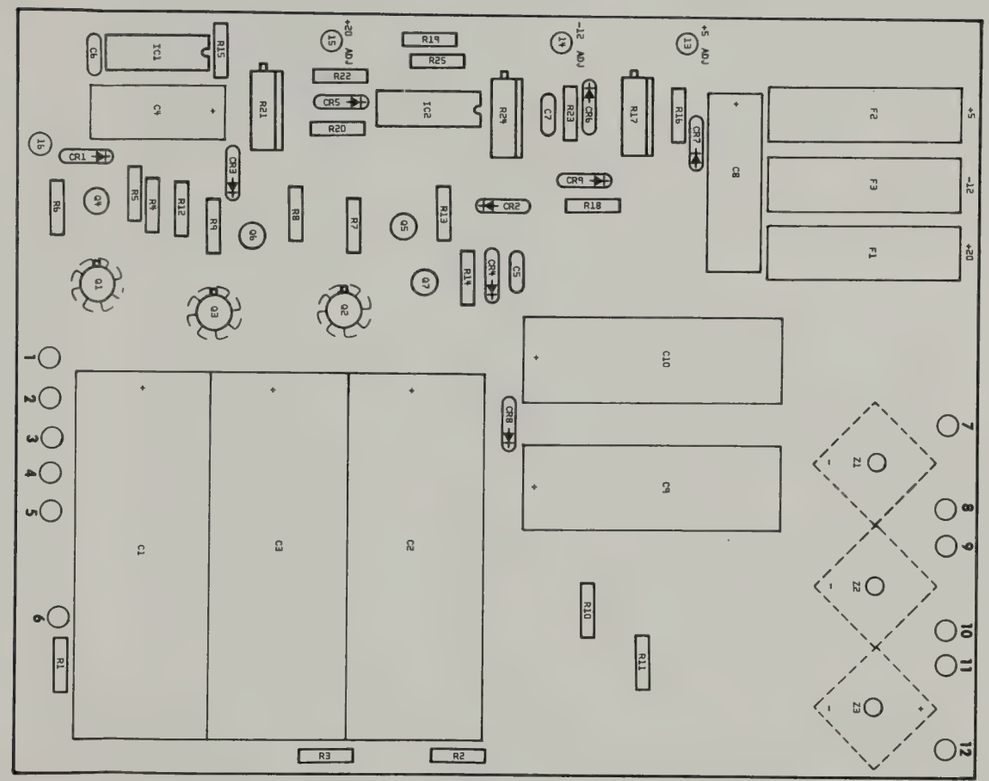
NOTE:

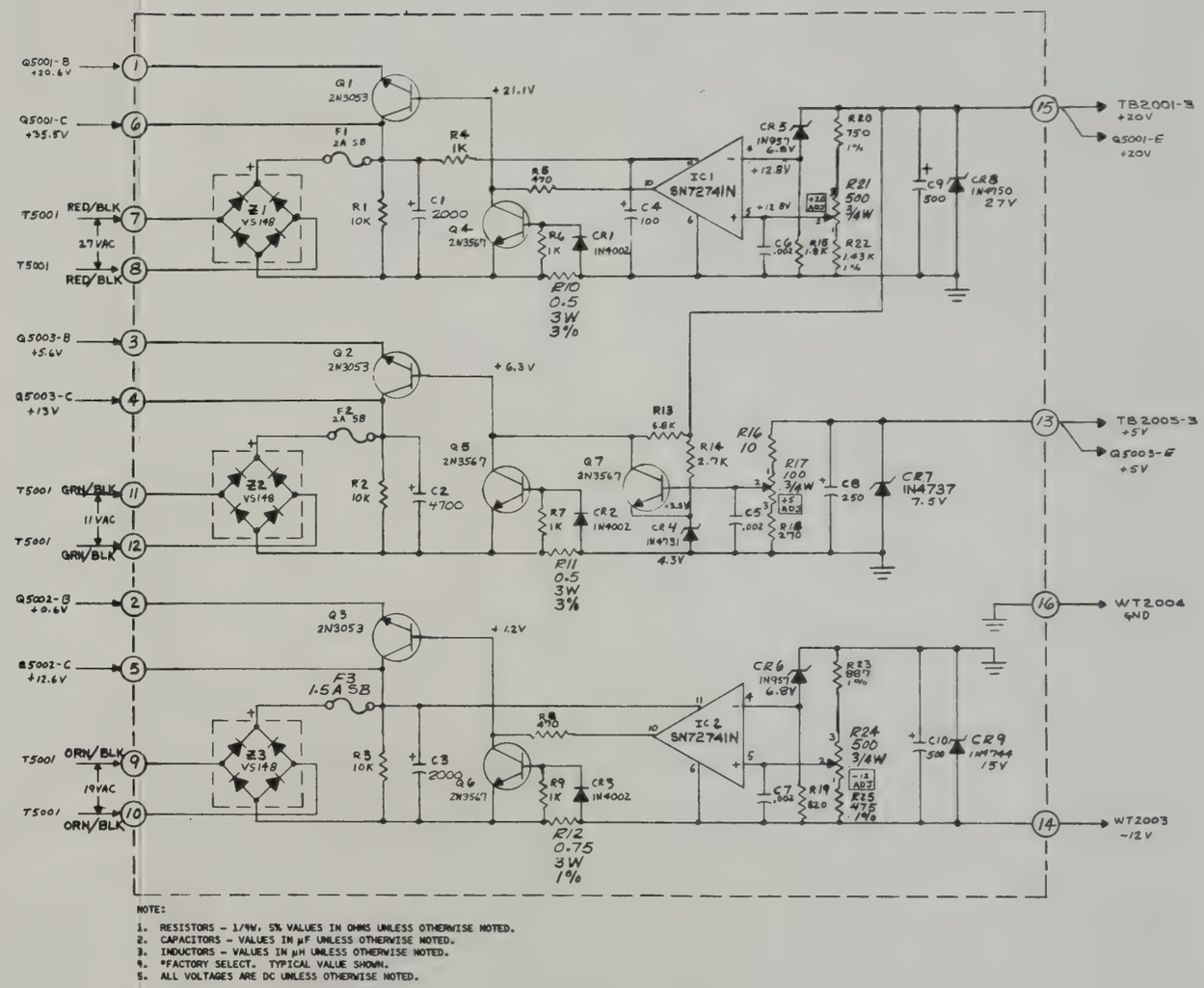
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

Figure 6-34. Power Supply/Regulator. 5100

POWER SUPPLY/REGULATOR (cont). 5100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	WW, .5Ω, ±3%, 3W	1159-0002	Dale	RS-2B
R12	WW, .75Ω, ±1%, 3W	1159-0005	Dale	RS-2B
R13	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R14	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R15	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R16	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R17	Pot, 100Ω, ±10%, 3/4W	1215-0010	Helitrim	89 WR
R18	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R19	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R20	Metal Film, 750Ω, ±1%, 1/8W	1075-0043	Dale	MFF 1/8 T1
R21	Pot, 500Ω, ±10%, 3/4W	1215-0011	Helitrim	89 WR
R22	Metal Film, 1.43k, ±1%, 1/8W	1075-0021	Dale	MFF 1/8 T1
R23	Metal Film, 887Ω, ±1%, 1/8W	1075-0022	Dale	MFF 1/8 T1
R24	Pot, 500Ω, ±10%, 3/4W	1215-0011	Helitrim	89 WR
R25	Metal Film, 475Ω, ±1%, 1/8W	1075-0023	Dale	MFF 1/8 T1
	TRANSISTORS			
Q1	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q2	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q3	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q4	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q5	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q6	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q7	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567





NOTE:

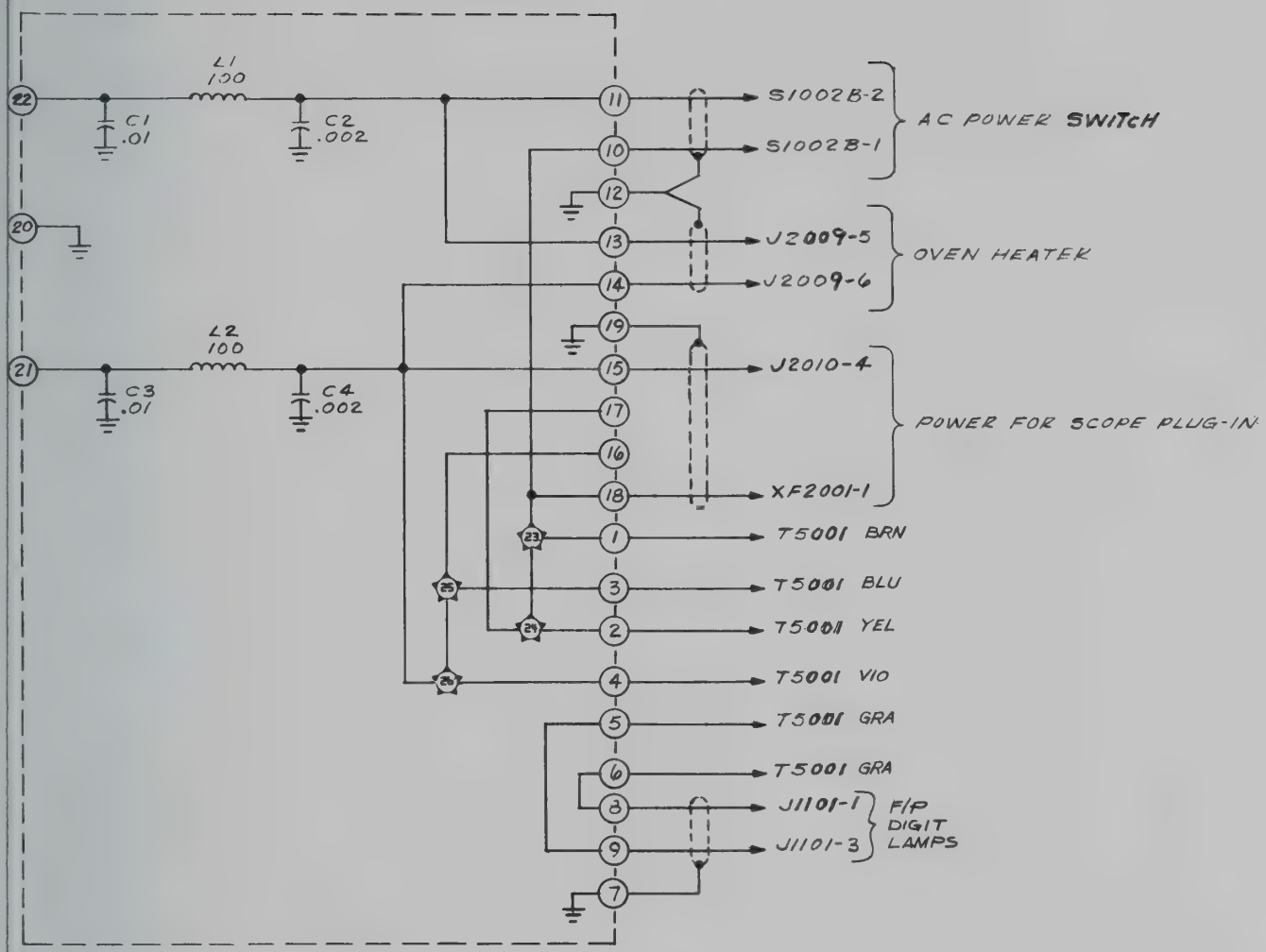
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN µF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN µH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

5601**0040

Figure 6-34. Power Supply/Regulator. 5100

A.C. FILTER. 5200

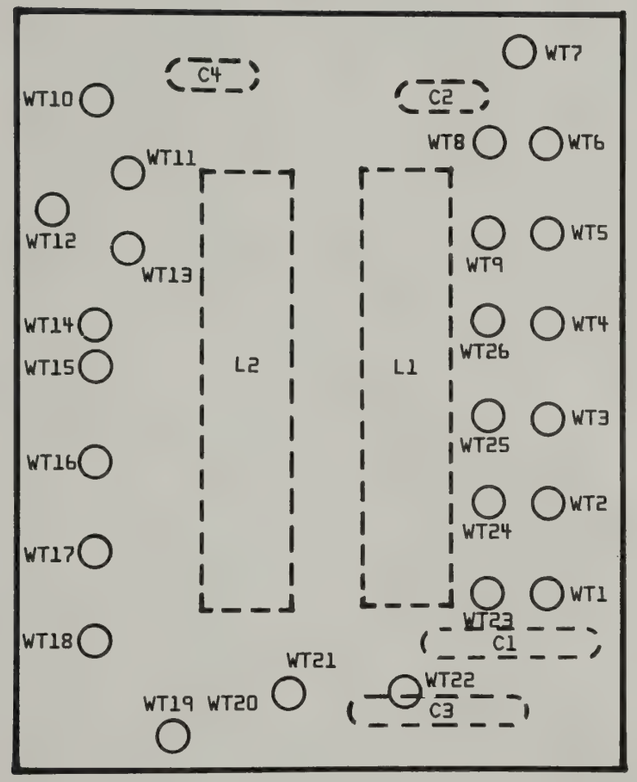
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
5200	AC Filter			
	PC Board Assy	7001-0173	Cushman	
	PC Board	1780-0316	Cushman	
	CAPACITORS			
C1	Cer, .01μF, ±20%, 1.4kV	1005-0051	Sprague	125L-S10
C2	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C3	Cer, .01μF, ±20%, 1.4kV	1005-0051	Sprague	125L-S10
C4	Cer, .002μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
	COILS			
L1	RF Choke, 100μH, molded	1585-0040	Miller	B-6021
L2	RF Choke, 100μH, molded	1585-0040	Miller	B-6021

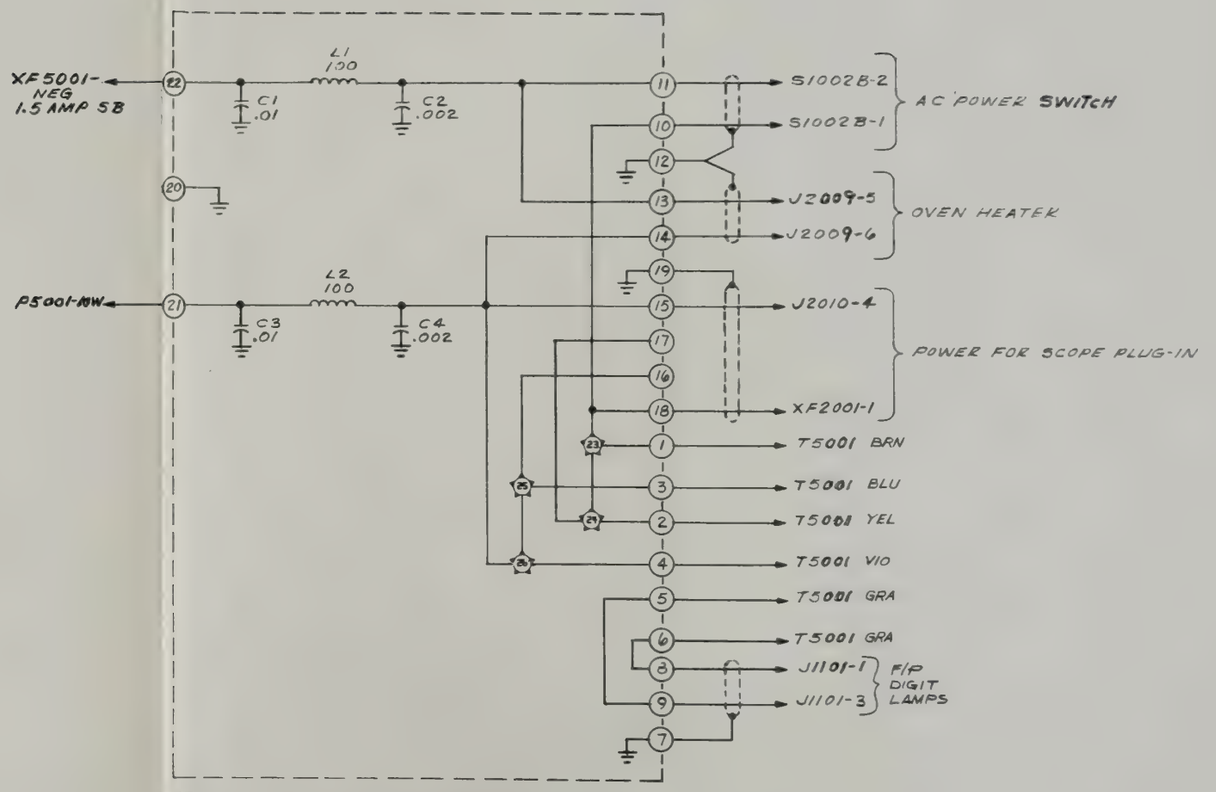


NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. INSTALL MODIFICATION KIT# 7100-0092 (M1) FOR 230V OPERATION.

Figure 6-35. A. C. Filter. 5200





NOTE:

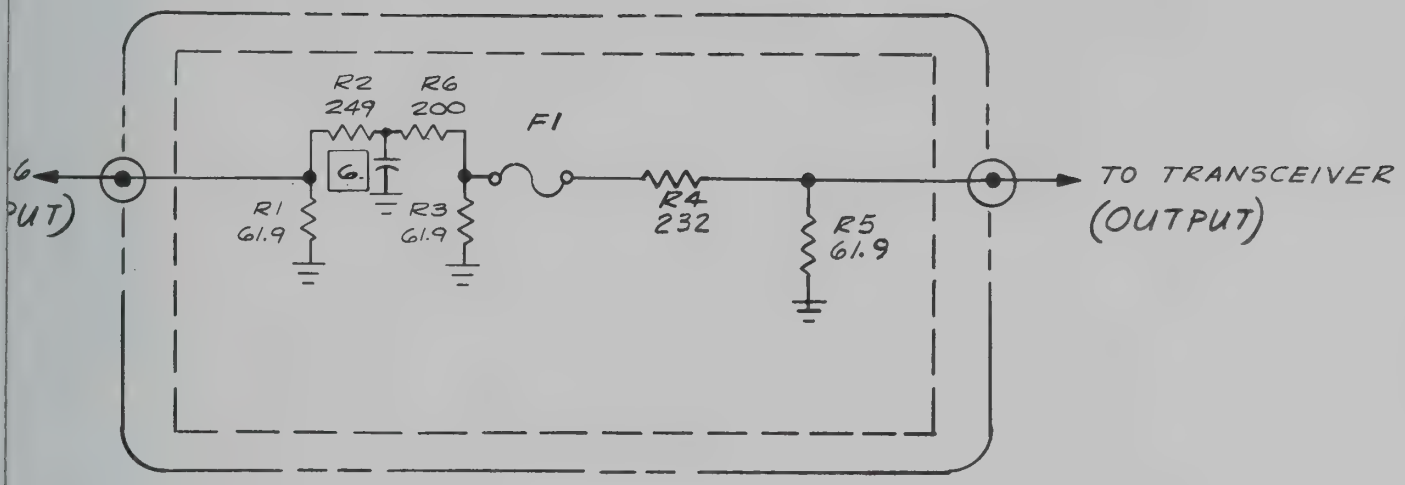
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

b. INSTALL MODIFICATION KIT# 7100-0092 (M1) FOR 230V OPERATION.

Figure 6-35. A. C. Filter. 5200

40 dB PAD ATTENUATOR

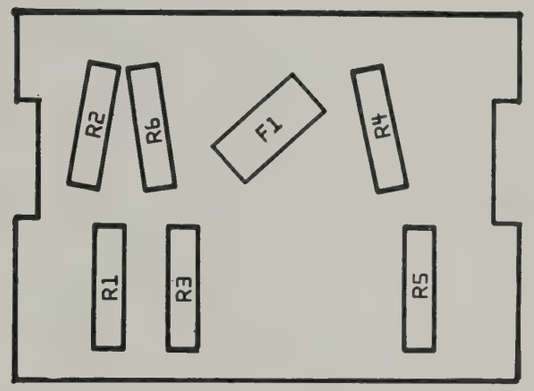
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	40 dB Pad Attenuator			
	PC Board Assy	7001-0187	Cushman	
	PC Board	1780-0304	Cushman	
	FUSES			
F1	1/32 Amp	1955-0005	Bus	GFA 1/32
	RESISTORS			
R1	Metal Film, 61.9Ω, ±1%, 1/10W	1075-0007	Dale	MFF 1/10 T1
R2	Metal Film, 249Ω, ±1%, 1/10W	1074-0098	Dale	MFF 1/10 T1
R3	Metal Film, 61.9Ω, ±1%, 1/10W	1075-0007	Dale	MFF 1/10 T1
R4	Metal Film, 232Ω, ±1%, 1/10W	1074-0097	Dale	MFF 1/10 T1
R5	Metal Film, 61.9Ω, ±1%, 1/10W	1075-0007	Dale	MFF 1/10 T1
R6	Metal Film, 200Ω, ±1%, 1/8W	1075-0082	Dale	MFF 1/8 T1

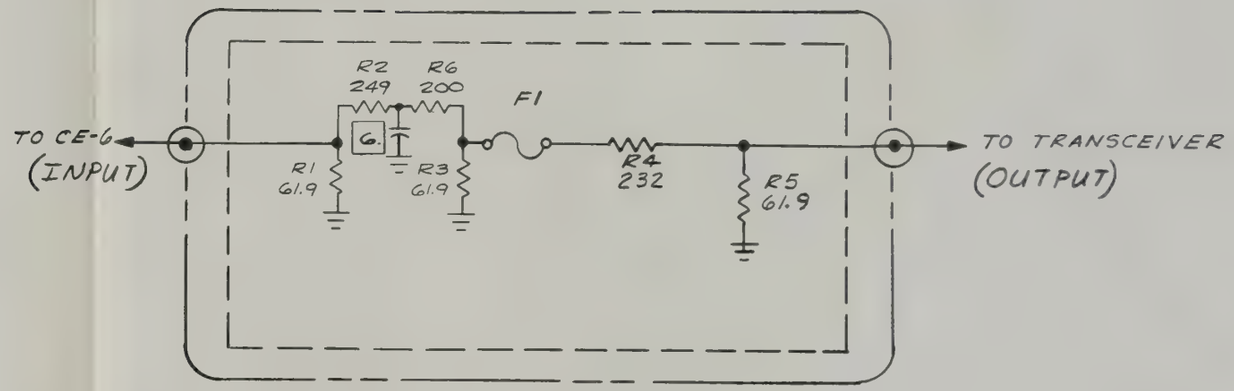


NOTE:

1. RESISTORS -1/10W, 1% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. STRIPLINE CAPACITOR SEGMENTS.

Figure 6-36. 40 dB Pad Attenuator





NOTE:

1. RESISTORS -1/10W, 1% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. STRIPLINE CAPACITOR SEGMENTS.

Figure 6-36. 40 dB Pad Attenuator

DEAR CUSTOMER:

Every effort has been made to ensure the accuracy of this manual. If an error is discovered please notify us on the postpaid cards attached.

Please indicate where the error has been made. To improve future manuals your comments are requested.

CUSHMAN ELECTRONICS
PUBLICATIONS DEPARTMENT

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